MidNite Solar Classic
Owner's Manual

This Manual covers models Classic 150, 200, 250 &250KS

The MidNite Solar Classic charge controller conforms to ***UL 1741, Safety for Inverters, Converters, Controllers and Interconnection System Equipment for Use With Distributed Energy Resources, Second Edition, May 7, 1999 with revisions through January 28, 2010 and CAN/CSA C22.2 No. 107.1: 2001/09/01 Ed: 3 (R2006)***

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Scope

This Manual provides safety guidelines and installation information for the Classic charge controller. It does not provide brand specific information about photovoltaic panels, batteries etc. Contact the manufacturer of other components in the system for relevant technical data.

Introduction

The MidNite Classic charge controller is unique in its ability to be used for a great variety of DC input sources. The Classic is designed to regulate DC input from PV, Hydro, Wind and other DC sources..
The Classic 150, 200 and 250 are designed to work with 12, 24, 36, 48, 60 and 72 volt battery banks.
The Classic250KS is designed to charge up to a 120V nominal battery bank.
The Classic can be installed stand alone or as a multi-unit networked installation.

Standard features of the Classic charge controller include:
*3 input operating voltage ranges 150, 200 and 250 VDC
*Multiple DC input options (example Solar, Wind or Hydro)
*Wizard driven setup interface including voice and help screens
*Graphical display
*Previous 180 days of operational data logged
*Internet ready

This Manual covers ***Classic 150, Classic 200 Classic 250 and the Classic 250KS***. It covers the installation, wiring and use of the Classic charge controller.

WARNING Warnings signs identify conditions or practices that could result in personal injury or loss of life.

CAUTION Cautions identify conditions or practices that could result in damage to the unit or other equipment.

MIDNITE SOLAR CHARGE CONTROLLER INSTALLATION GUIDELINES AND SAFETY INSTRUCTIONS

This product is intended to be installed as part of a permanently grounded electrical system as shown in the system configuration sections. The following important restrictions apply *unless superseded by local or national codes*:

•The System's DC Negative conductor must not be bonded to earth ground. The Classic does this with its internal Ground Fault Protection circuitry. The battery negative and ground are not bonded together directly but are connected together by the Classic's internal GFP device. All negative conductor connections must be kept separate from the grounding conductor connections. The equipment ground terminal inside the Classic must be connected to Earth Ground for the internal DC-GFP to work. *Continue*

• With the exception of certain telecom applications, the Charge Controller should *never* be positive grounded.

• The Charge Controller equipment ground is marked with this symbol:
• If damaged or malfunctioning, the Charge Controller should only be disassembled and repaired by a qualified service center. Please contact your renewable energy dealer/installer for assistance. Incorrect reassembly risks malfunction, electric shock or fire.
• The Charge Controller is designed for indoor installation or installation inside a weatherproof enclosure. It must not be exposed to rain and should be installed out of direct sunlight.

For routine, user-approved maintenance:

• Turn off all circuit breakers, including those to the solar modules, batteries and related electrical connections before performing any maintenance.

Standards and Requirements

All installations must comply with national and local electrical codes; professional installation is recommended. The NEC in the USA requires a DC ground fault interrupter for all residential PV installations. NEC2011 requires an ARC FAULT detector on all charge controllers and inverters operating above 80VDC. Both of these devices are built into the Classic.

DC and Battery-Related Installation Requirements:

- All DC cables must meet local and national codes.
- Shut off all DC breakers before connecting any wiring.
- Torque all the Charge Controller's wire lugs and ground terminals to the specs found on page 19.
- Copper wiring must be rated at 75° C or higher.
- Keep cables close together (e.g., using a tie-wrap) as much as possible to reduce inductance.
- Ensure both cables pass through the same knockout and conduit to allow the inductive currents to cancel.
- DC battery over-current protection must be used as part of the installation on the input and output.
- Breakers between the battery and the Classic must meet UL489 standards.
- Breakers between the DC source and the Classic must meet UL1077 or UL489 standards.

Design the battery enclosure to prevent accumulation of hydrogen gas at the top of the enclosure. Vent the battery compartment from the highest point to the outside. A sloped lid can also be used to direct the flow of hydrogen to the vent opening. Sealed (AGM, Gel etc) batteries do not normally require ventilation. Consult your battery manufacturer for details.

WARNING: PERSONAL PRECAUTIONS DURING INSTALLATION

WARNING BATTERIES PRESENT RISK OF ELECTRICAL SHOCK, BURN FROM HIGH SHORT CIRCUIT CURRENT, FIRE OR EXPLOSION FROM VENTED GASES. FOLLOW PROPER PRECAUTIONS.

- Someone should be within range of your voice to come to your aid if needed.
- Keep plenty of fresh water and soap nearby in case battery acid contacts skin, clothing, or eyes.
- Wear complete eye protection. Avoid touching eyes while working near batteries. Wash your hands with

soap and warm water when done.

- If battery acid contacts skin or clothing, wash immediately with soap and water. If acid enters an eye, flood the eye with running cool water at once for at least 15 minutes and get medical attention immediately following.
- Baking soda neutralizes lead acid battery electrolyte. Keep a supply on hand in the area of the batteries.
- NEVER smoke or allow a spark or flame in vicinity of a battery or generator.
- Be cautious to reduce the risk of dropping a metal tool onto batteries. It could short the batteries or other electrical parts that can result in fire or explosion.
- Never wear metal items such as rings, bracelets, necklaces, and watches when working with a battery or other electrical circuits. A battery can produce a short circuit current high enough to weld a ring or the like to metal, causing severe burns.

Classic Power Curves

Figure 2.1

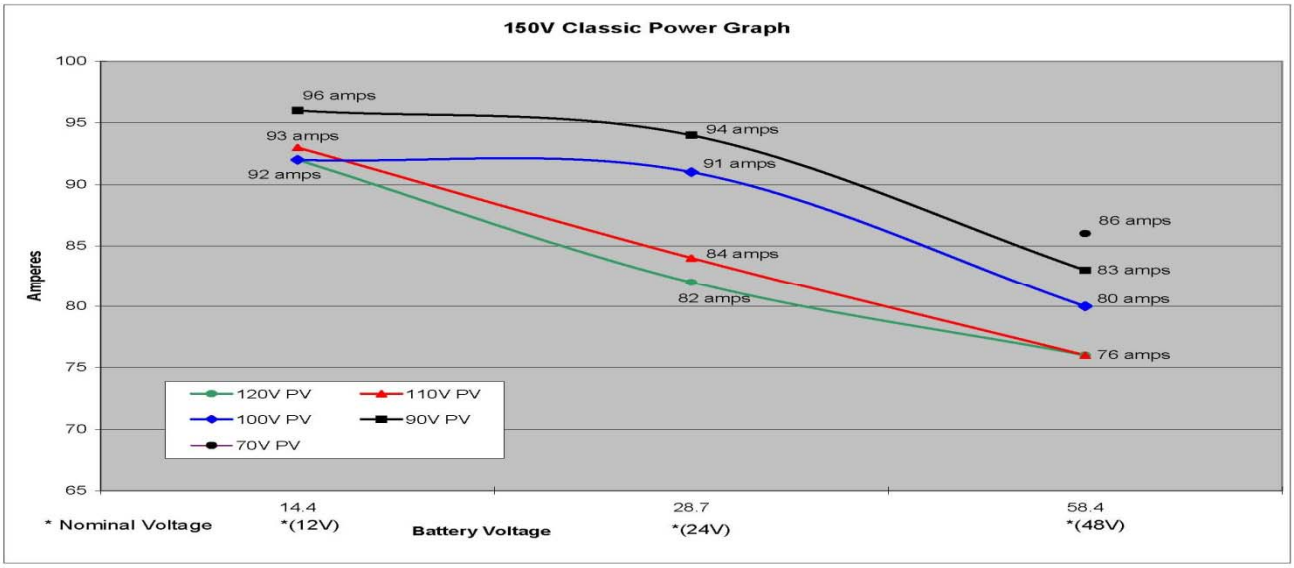


Figure 2.2

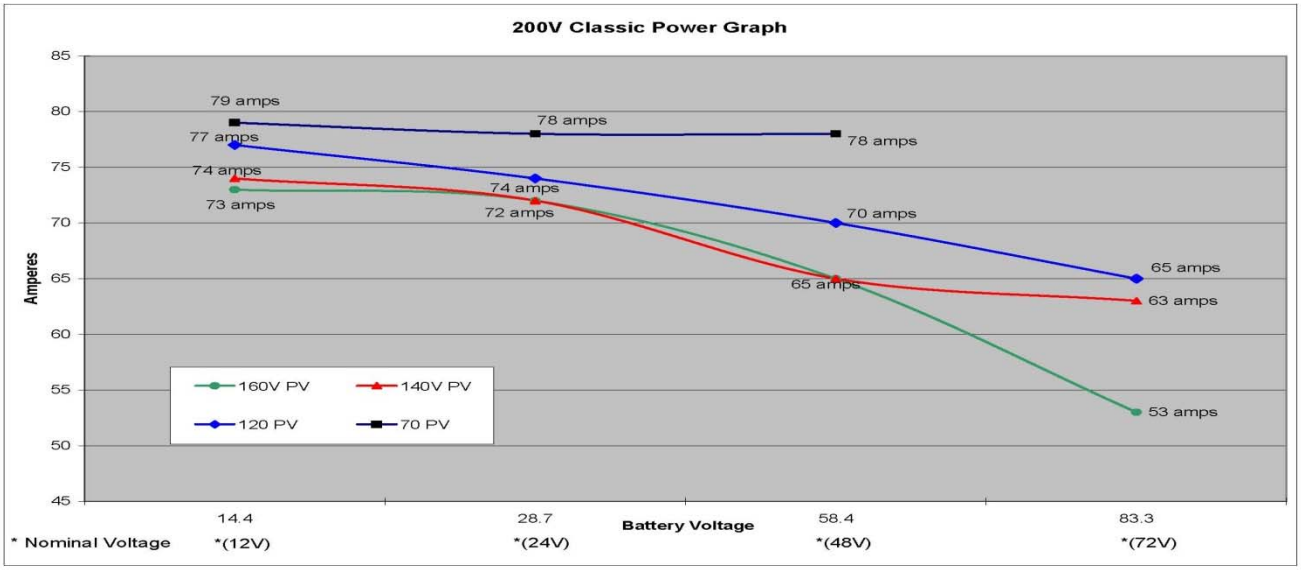
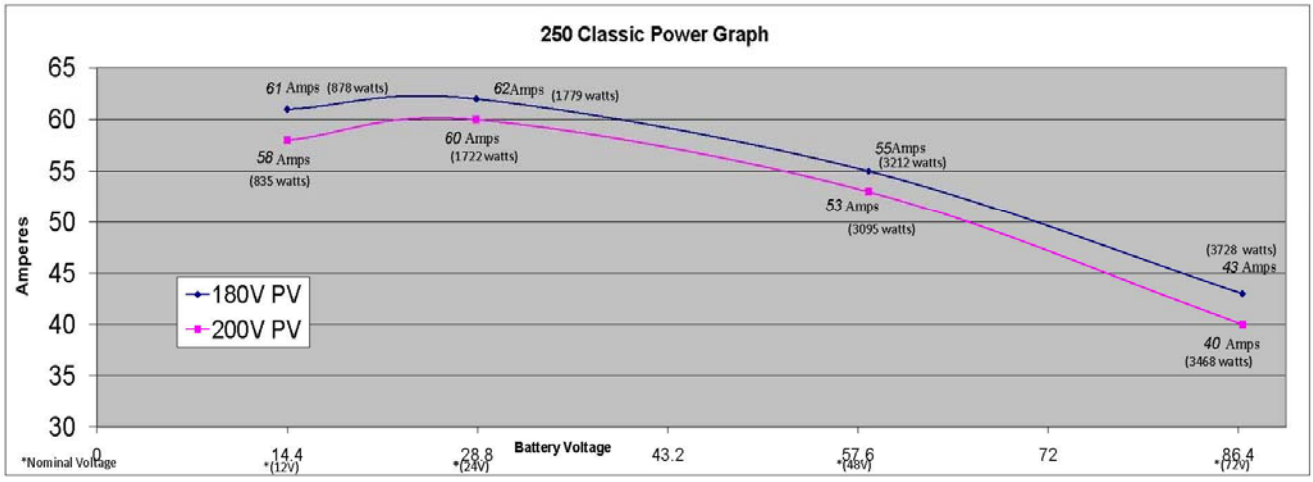


Figure 2.3



The graphs above represent the max power output for a given input for each Classic. Using and understanding these power graphs will help maximize Classic's output power and aid in selecting wire and breaker/disconnects. The built in set up wizard also helps select breakers and wire sizes. Notice that lower battery voltages and lower PV input voltages result in higher continuous output power. The PV voltages listed are for reference and are not intended to be the only PV voltages supported. The battery voltages listed show the most used battery bank configurations. Other voltages are also supported. The Classic battery voltage parameters are fully user adjustable.

For example: if you are using a Classic 250 and 48v battery bank, the maximum continuous output power based on 25 degree C ambient is 55 amps when using a PV array that yields a Maximum Power Voltage of 180 volts. The same set up using a bit higher voltage modules that result in a 200V Maximum Power voltage will result in only 53 amps. Although 55 to 53 amps is not a significant change, it does give you the idea that all things being equal, lower voltages are a bit more efficient.

Below are the labels present on the Classic.

MIDNITE SOLAR CLASSIC 250KS
MPPT SOLAR, WIND, HYDRO, BUCK, BOOST CHARGE CONTROLLER
NORMAL OPERATING ENVIRONMENT 25°C (45°C DE-RATED SEE MANUAL)
MAX PV VOLTAGE (OPERATING) 250V
MAX PV CURRENT(OPERATING) 55A
MAX PV VOC 250V + BATTERY VOLTAGE
MAX PV SHORT CIRCUIT CURRENT 55A
MAX BATTERY CHARGE CURRENT 55A
MAX BATTERY CHARGE VOLTAGE 150V
NOMINAL BAT VOLTAGES 12-120V
MAX OUTPUT FAULT CURRENT 436A
CE

MIDNITE SOLAR CLASSIC 200

MPPT SOLAR, WIND, HYDRO, BUCK, BOOST CHARGE CONTROLLER

NOMINAL OPERATING ENVIRONMENT 25°C (40° C DE-RATED SEE MANUAL)

CONFORMS TO UL STANDARD 1741
2ND EDITION MAY 7, 1999
WITH REVISIONS THROUGH
JANUARY 28, 2010

Intertek 3084883

CERT. TO CAN/CSA
STD. C22.2
No. 107.1 2001/09/01

MAX PV VOLTAGE (OPERATING) 200V
MAX PV CURRENT (OPERATING) 79A
MAX PV VOC 200V + BATTERY VOLTAGE
MAX PV SHORT CIRCUIT CURRENT 79A
MAX BATTERY CHARGE CURRENT 79A
MAX BATTERY CHARGE VOLTAGE 93V
NOMINAL BAT VOLTAGES 12-72V
MAX OUTPUT FAULT CURRENT 436A

MIDNITE SOLAR CLASSIC 150

MPPT SOLAR, WIND, HYDRO, BUCK, BOOST CHARGE CONTROLLER

NOMINAL OPERATING ENVIRONMENT 25°C (40°C DE-RATED SEE MANUAL)

CONFORMS TO UL STANDARD 1741
2ND EDITION MAY 7, 1999
WITH REVISIONS THROUGH
JANUARY 28, 2010

Intertek 3084883

CERT. TO CAN/CSA
STD. C22.2
No. 107.1 2001/09/01

MAX PV VOLTAGE (OPERATING) 150V
MAX PV CURRENT (OPERATING) 96A
MAX PV VOC 150V + BATTERY VOLTAGE
MAX PV SHORT CIRCUIT CURRENT 96A
MAX BATTERY CHARGE CURRENT 96A
MAX BATTERY CHARGE VOLTAGE 93V
NOMINAL BAT VOLTAGES 12-72V
MAX OUTPUT FAULT CURRENT 436A

Designed and built in the U.S.A.

MIDNITE SOLAR CLASSIC 250

MPPT SOLAR, WIND, HYDRO, BUCK, BOOST CHARGE CONTROLLER

NOMINAL OPERATING ENVIRONMENT 25°C (40° C DE-RATED SEE MANUAL)

CONFORMS TO UL STANDARD 1741
2ND EDITION MAY 7, 1999
WITH REVISIONS THROUGH
JANUARY 28, 2010

Intertek 3084883

CERT. TO CAN/CSA
STD. C22.2
No. 107.1 2001/09/01

MAX PV VOLTAGE (OPERATING) 15-250V
MAX PV CURRENT(OPERATING) 62A
MAX PV VOC 250V + BATTERY VOLTAGE
MAX PV SHORT CIRCUIT CURRENT 62A
MAX BATTERY CHARGE CURRENT 62A
MAX BATTERY CHARGE VOLTAGE 93V
NOMINAL BAT VOLTAGES 12-72V
MAX OUTPUT FAULT CURRENT 436A

MIDNITE SOLAR, INC

Q1 Q2 Q3 Q4 10 11 12 13 14

AUX OUTPUT 1: 13VDC 200mA - RECONFIGURABLE AS 3.3VDC AUX **INPUT**
AUX OUTPUT 2: 500mA RELAY DRY CONTACT- RECONFIGURABLE AS 13VDC 200mA OUTPUT

MINIMUM INTERRUPT RATING: 4000 AMPS DC FOR OVERCURRENT PROTECTION DEVICE

TORQUE TERMINAL BLOCK AND GND TERMINAL TO 35 IN-LBS (4Nm). SUITABLE FOR USE WITH 75°C MINIMUM RATED COPPER CONDUCTORS.

THIS DEVICE IS PROVIDED WITH AN INTEGRAL PV DC GROUND FAULT INTERRUPTER. IF THE PV GROUND FAULT-PROTECTION IS TRIPPED, THE NEGATIVE CONDUCTOR MAY BE ENERGIZED.

DANGER
CAUTION

ELECTRICAL SHOCK AND BURN HAZARD. SOLAR PANELS WILL CONTINUE TO PRODUCE VOLTAGE EVEN WHEN DISCONNECTED. ENSURE THAT PV MODULES ARE COVERED. TURN OFF PV ARRAY AND CHARGE CONTROLLER OUTPUT PRIOR TO SERVICE. RISK OF ELECTRIC SHOCK. DO NOT REMOVE COVER. NO USER SERVICEABLE PARTS INSIDE. REFER SERVICING TO QUALIFIED SERVICE PERSONNEL.

ATTENTION
CAUTION

DANGER DE CHOC ÉLECTRIQUE ET DE RISQUE DE BRULURE. LES PANNEAUX SOLAIRES CONTINUERONT DE PRODUIRE L'ÉLECTRICITÉ MÊME SILS SONT DÉBRANCHÉS. S'ASSURER QUE LES PANNEAUX SOLAIRES SONT COUVERTS PENDANT L'ENTRETIEN. POUR TOUTE ACTION D'ENTRETIEN, LA SORTIE DES PANNEAUX SOLAIRES ET DU CONTRÔLEUR DE CHARGE DOIVENT ÊTRE DÉCONNECTÉES). RIEN À DÉPANNER À L'INTÉRIEURE DU E-PANNEAU. NE PAS OUVRIR LE COUVER. POUR TOUTE RÉPARATION OU SERVICE D'ENTRETIEN, CONSULTER UN AGENT SPÉCIALISÉ.

10-028-1

ATTENTION
SURFACES CHAUDES

CAUTION
HOT SURFACES

CL00001

MIDNITE SOLAR, INC.
17722 67TH AVE NE UNIT C
ARLINGTON, WA. 98223 USA
WWW.MIDNITESOLAR.COM

Unpacking the Classic

When you receive your Classic you will want to unpack it and make sure everything is there and in good shape. Refer to Figure 1.1. Included in the Classic package should be:

*Classic charge controller
*Battery temperature sensor
*Snap on upper vent cover
*Knock out covers 4 screened and 4 solid
*User's manual DVD, printed installation instructions
*1 ten foot custom USB cable

If anything is missing or damaged please refer to Page 2 for details on contacting us.

Figure 1.1

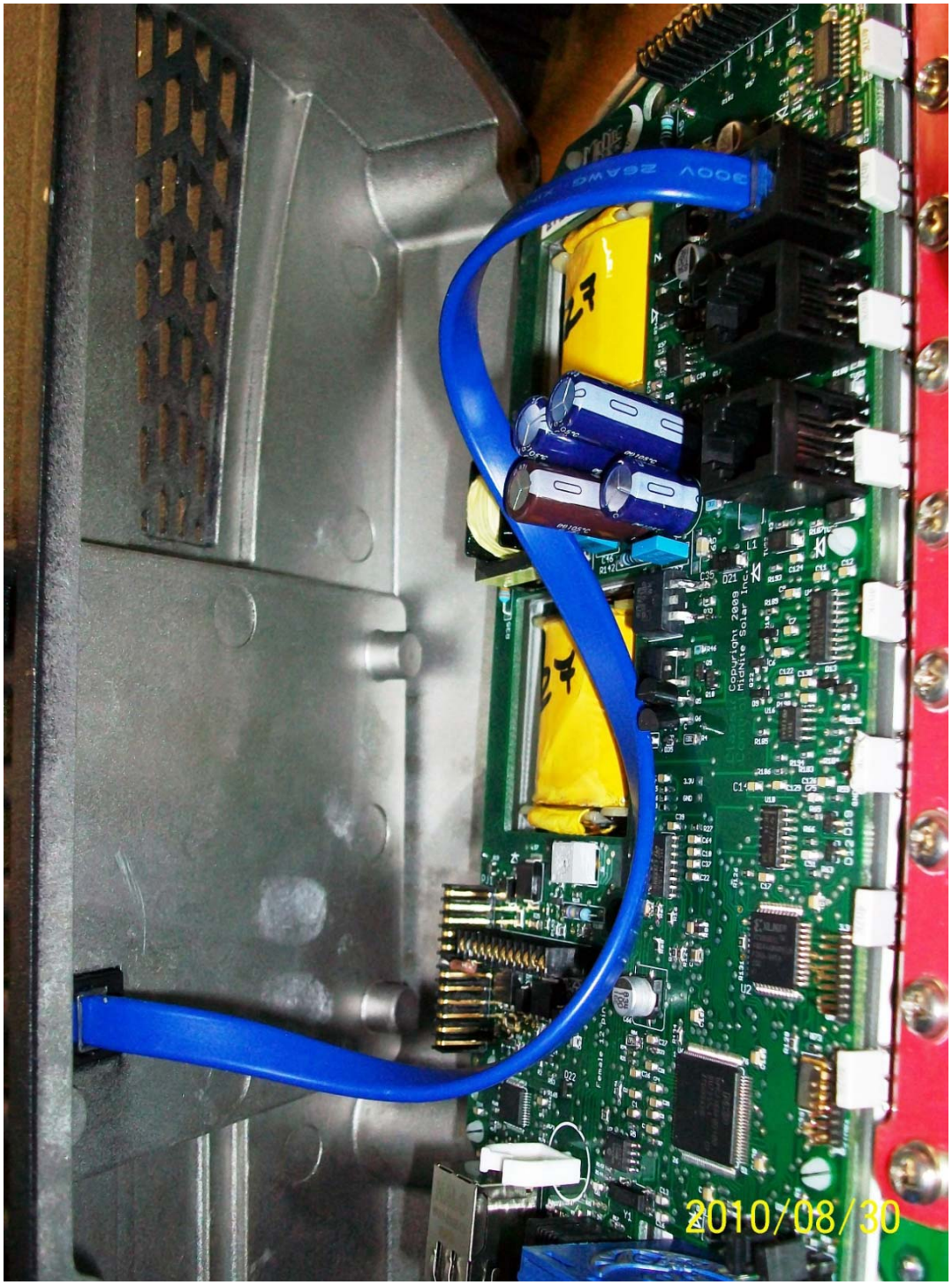
Removing and installing the front cover on the Classic

Removing the front art deco cover is required to gain access to the wiring compartment.
Be aware there is a cable connecting the cover to the electronics. Do not pull hard or fast. Damage will result.

To remove the front cover of the Classic in preparation for installation, remove the 4 Phillips head screws with a #2 Phillips screwdriver. Lift the front half of the Classic casting off. You will need to unplug the display cable. It works the same as any 10" long 6 conductor phone cable
To re-install the front cover of the Classic you will need to plug in the display cable and carefully route

it around the components on the circuit board as you set the cover in place. See Figure 1.2 Do not force the cover if it does not seat into place easily stop and look for any cables or wires that may be interfering. With the cover seated in place install the four Phillips screws with a #2 Phillips screwdriver.

Figure 1.2



Mounting the Classic

The following section covers typical mounting arrangements. If you require additional details that are not covered here please contact us at technical support. The Classic is designed to be directly mounted onto the MidNite Solar E-Panel as well as other installation methods. Mount in an upright position out of direct sunlight when possible. The Classic has four one inch knock outs for your convenience they are pre cast. The Classic has mounting and conduit location similar to other brands to facilitate ease of upgrading older technologies to features available only on the Classic.

Mounting the Classic directly to the E Panel:
*Remove the front cover of the Classic.
*Install the mounting bracket on the E Panel and start the upper mounting screw into the bracket leaving it about half way out so you can hang the Classic on this screw.
*Install the 1 inch close nipple into the E Panel as shown in the E-Panel directions. The 1” close nipple, 3 locknuts and 2 plastic bushings are included with each E-Panel. One locknut acts as a spacer.
*Carefully hang the Classic on the screw in the bracket and slide it over the close nipple see figure 1.3.
*Install the lock nut and bushing on the close nipple and tighten the screw in the mounting bracket.
*Don't install the front cover until you complete the wiring of the Classic.

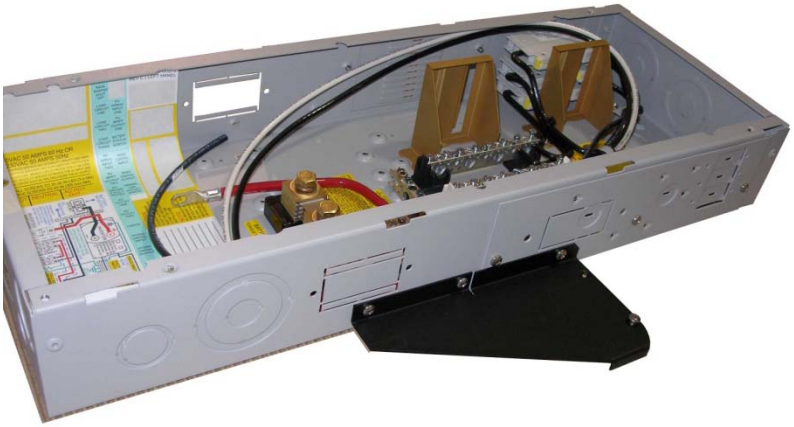
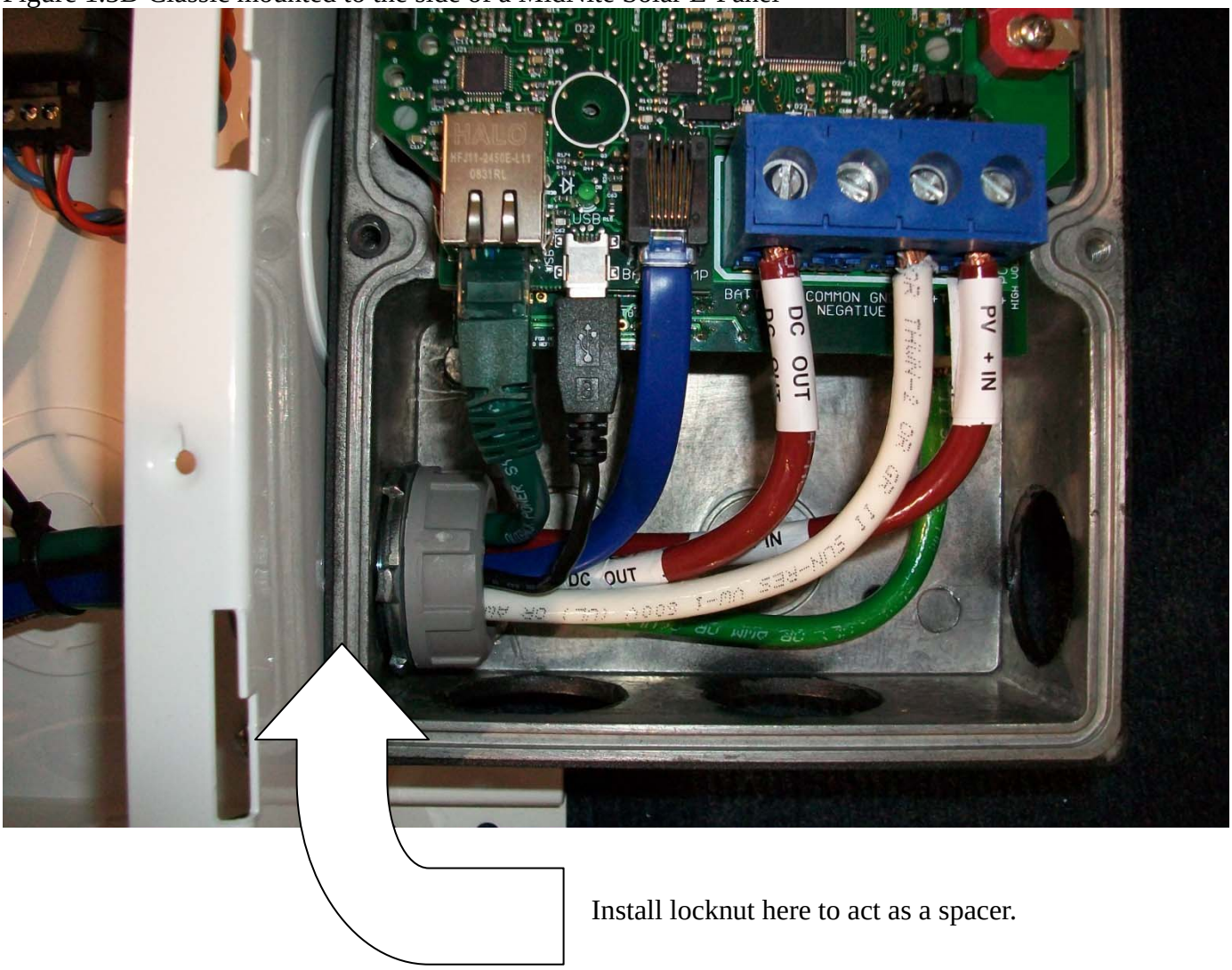


Figure 1.3A Charge controller bracket mounted to the E-Panel. The bracket comes with every E-Panel

Figure 1.3B Classic Mounted to side of E-Panel

Figure 1.3C Nipple, locknuts and bushings that come with every E-Panel

Figure 1.3D Classic mounted to the side of a MidNite Solar E-Panel



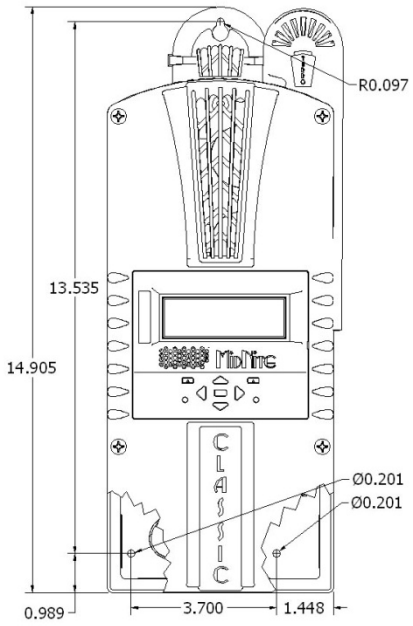
Install locknut here to act as a spacer.

Alternative Mounting

To mount the Classic to a plywood surface use 1 1/2” wood screws in the top key hole slot hole and the holes in the wiring compartment. Taking care to make sure the Classic is Plumb and Level.

Dimensions

See page 40 for more details.



Sealed or Vented

The Classic ships with all parts needed to convert to a sealed unit. If you live in a dusty or salt air environment you may wish to seal the Classic. Sealing the Classic does not make the unit water resistant. To seal the Classic install the solid plastic knock out covers into any unused knock outs and snap the upper vent cover onto the Classic as

seen in the photo below. Note that the Classic will be slightly de-rated (puts out less power) by sealing it. Refer to the owner's manual for the specifications page for ratings in the sealed mode. Refer to Figure 1.4 and 1.5

Figure 1.4

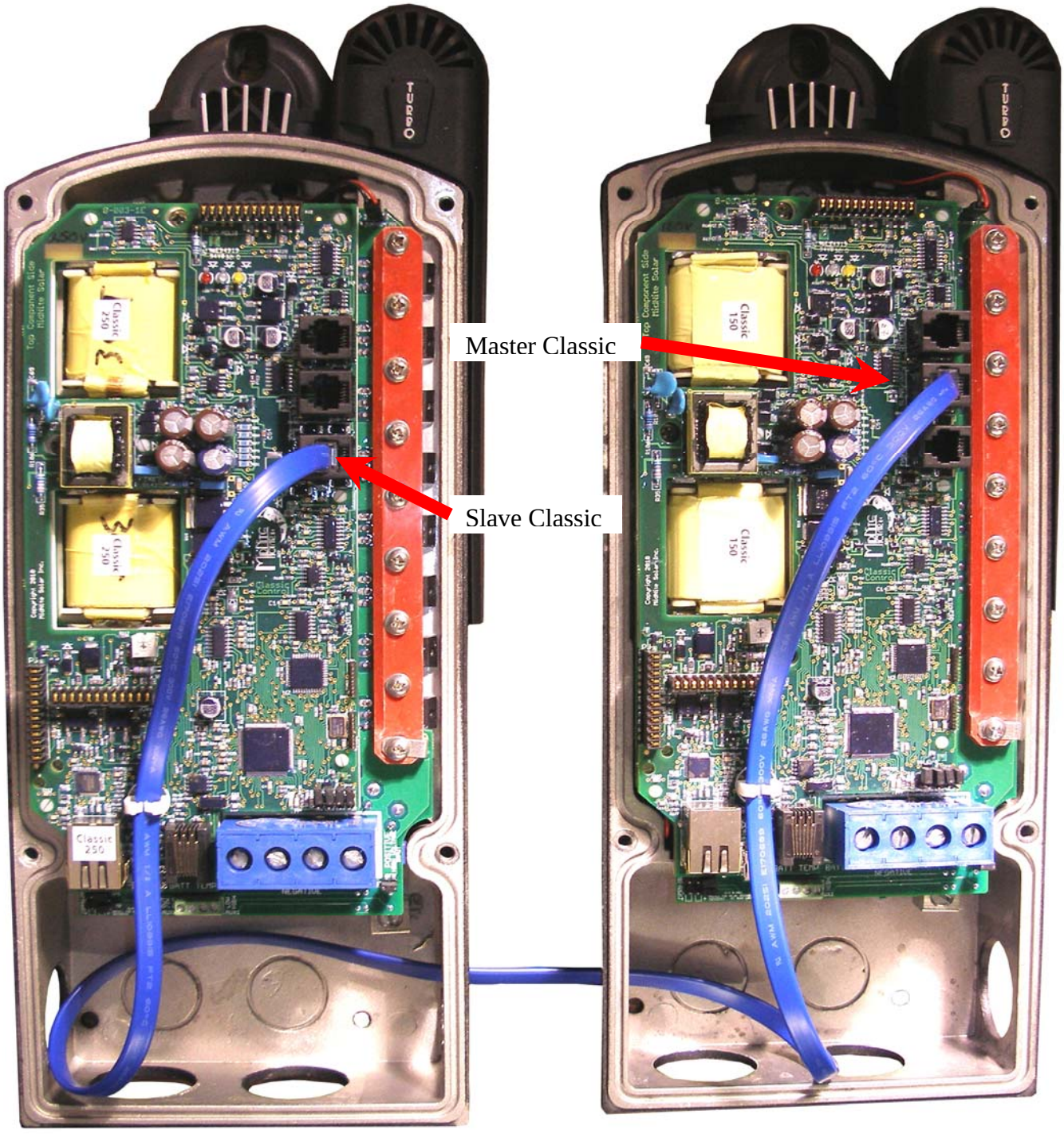
Figure 1.5

Figure 1.6 Power wire hook up between the Classic and E-Panel

Network Cable Routing and Installation Guidelines

The Classic uses a network cable to communicate with other Classic's or other MidNite products. This cable is a standard 6 conductor phone cable and simply plugs into the jack on the Classic labeled slave. Plug the other end into the master jack on the second device. There is a plastic clamp located on the circuit board for routing the network cables above the USB jack so they stay tied down out of the way. Refer to figure 1.7A and 1.7B

Figure 1.7A Master / Slave methods of hook up



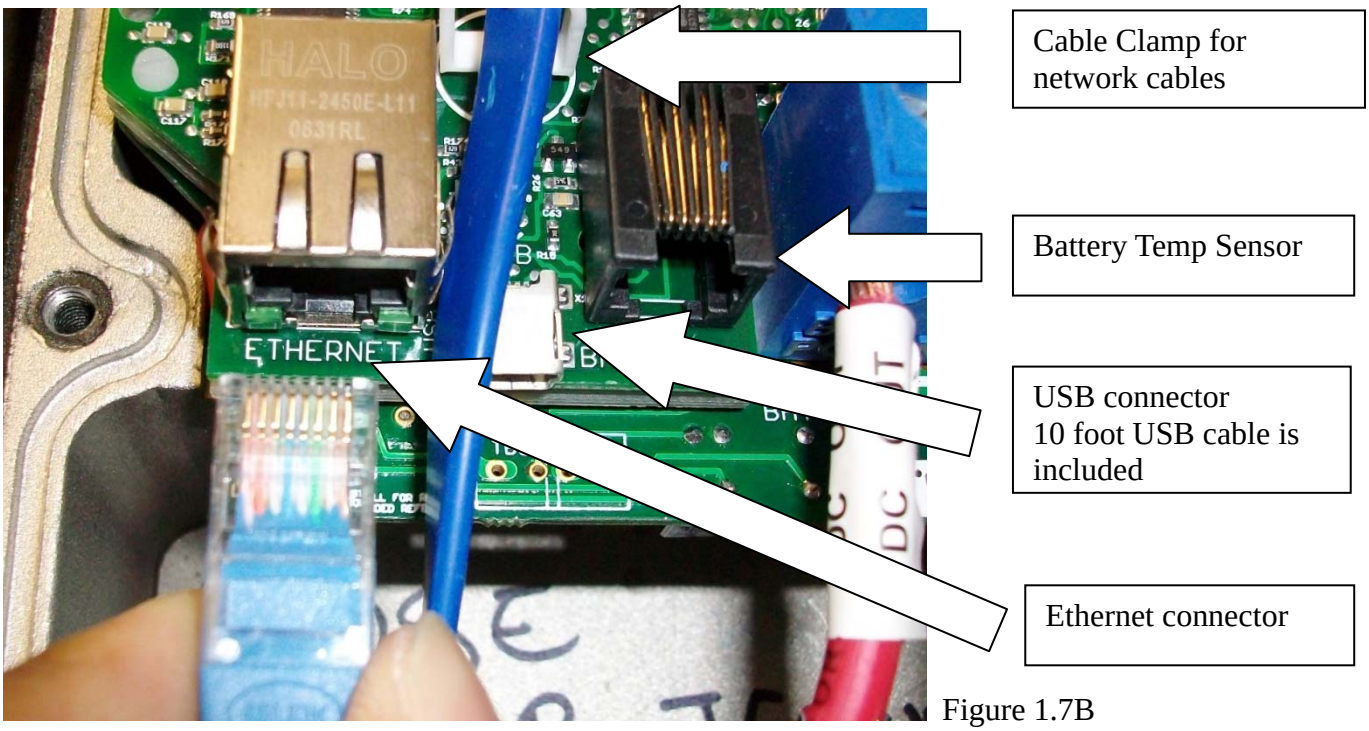


Figure 1.7B

Battery Temperature Sensor Installation

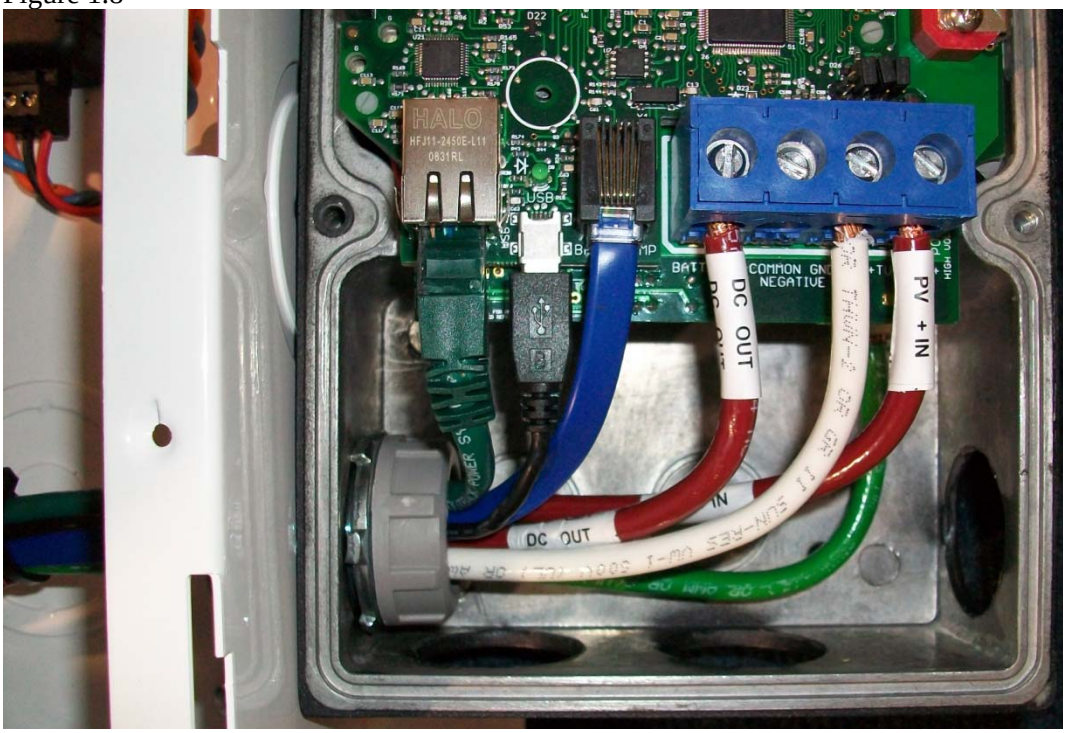
CAUTION - To reduce risk of injury, charge only deep-cycle lead acid, lead antimony, lead calcium, gel cell or absorbed glass mat type rechargeable batteries. Other types of batteries may burst, causing personal injury and damage. Never charge a frozen battery.

WARNING: RISK OF INJURY. To reduce the risk of injury, charge only properly rated (such as 6 V 12 V and 24 V) lead-acid (GEL, AGM, Flooded, or Nickel Cadmium) rechargeable batteries. Other battery types may burst, causing personal injury and damage.

WARNING: Explosion hazard during equalization, the battery generates explosive gases. Follow all the battery safety precautions listed in this guide. Ventilate the area around the battery using ventilators with brushless motors thoroughly and ensure that there are no sources of flame or sparks in the vicinity.

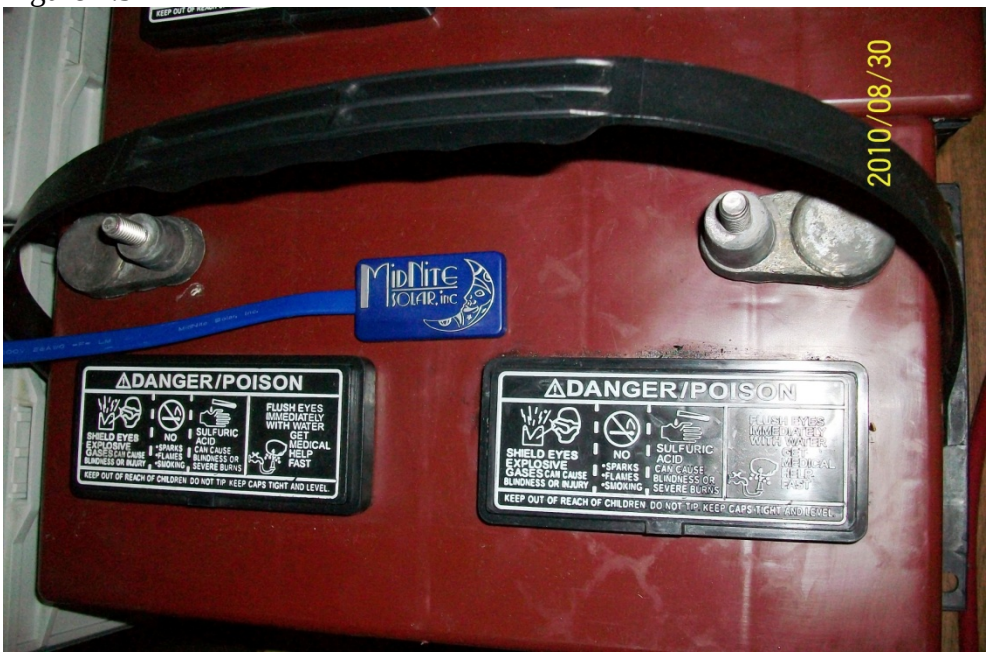
The Classic comes with a Battery temperature sensor which plugs into the jack beside the DC Terminal connector labeled “Battery Temp”. Refer to Figure 1.8 Route the cable through the E-panel into the battery box. Pick a battery in the middle of the bank and about half way up the side of the battery thoroughly clean a spot off on the case. Then remove the protective tape from the sensor and adhere the temperature sensor to the battery. Some manufacturers use a double wall case on the battery. For mounting a temp sensor to them please refer to the battery manufacturer's recommended procedure.

Figure 1.8



Insert BTS to the jack labeled BATTERY TEMP on the control board.

Figure 1.9


2010/08/30
MIDNITE SOLAR, INC
DANGER/POISON
SHIELD EYES
EXPLOSIVE GASES CAN CAUSE BLINDNESS OR INJURY
NO SPARKS FLAMES SMOKING
SULFURIC ACID CAN CAUSE BLINDNESS OR SEVERE BURNS
FLUSH EYES IMMEDIATELY WITH WATER GET MEDICAL HELP FAST
KEEP OUT OF REACH OF CHILDREN DO NOT TIP KEEP CAPS TIGHT AND LEVEL

Before placing the Battery Temperature Sensor make sure battery surface is clean from any dust or acids. Placement is not very critical.

Grounding

The Classic charge controller is designed to work with negatively grounded or ungrounded systems. For grounding conductor requirements on your specific installation please consult your local electrical code. The chassis grounding terminal is in the upper right corner of the electrical connection compartment see figure 2.0

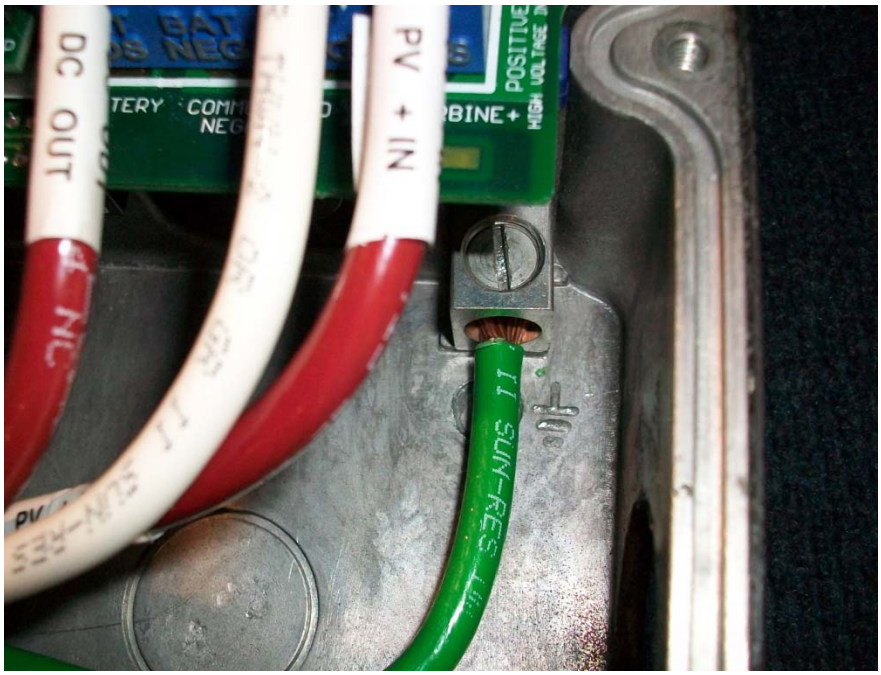
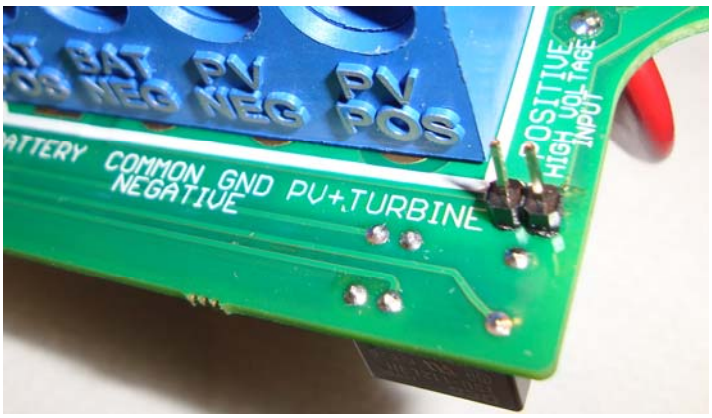


Figure 2.0

DC GFP (Ground Fault Protection)

The Classic has internal ground fault protection (GFP) built in. NEC 2008 requires a DC-GFP on all PV systems in the USA. The built in DC-GFP eliminates the need to purchase and install an external DC-GFP. If the internal GFP is enabled the battery negative and DC source negative must not be connected to the system grounding conductor anywhere in the system. Grounding of these circuits will defeat the GFP function. Only one Classic is to have the GFP function enabled. If more than one GFP device is enabled the feature may not work as designed. The factory setting will make a DC negative to System Ground connection in the Classic charge controller. The GFP function will need to be disabled for an ungrounded DC system.

Figure 2.1



The Ground fault device is simple to understand and use. The Classic DC-GFP works a bit different than others. It detects a fault between battery/PV negative and earth ground just like the breaker DC-GFP system. The difference with the Classic is that it simply turns off when a ground fault is detected. This is different than disconnecting the PV plus circuit. This trick of turning off was first pioneered by another charge control company as an alternative to $100 external circuit breaker assemblies. The Classic's system consists of a PTC that is between the

Negative and Ground internally in the Classic. A PTC is basically a type of resistor with a 1 ohm value that when loaded to three quarters of an amp will heat up and go to a very high resistance looking like an open circuit. One of the 3 Classic microprocessors watches the PTC and when it sees a high resistance it will disable the Classic. The Ground fault device will then require a manual reset. The PTC is self healing though so no Fuses to change. This method meets the requirement for DC ground fault protection in the National Electric Code.

To disable the internal Ground Fault Protection function, jumper labeled GFP needs to be removed, or it can be disabled in the TWEAKS menu. See section below for instructions.

To reset the internal GFP function after detection has occurred, fix the actual ground fault, then turn OFF Classic and turn it back ON. Do this by turning the external battery breaker to OFF position and then to ON position.

Disabling GFP

- Press Main Menu
- Scroll to the right or left until TWEAKS is highlighted and press ENTER
- In TWEAKS press the right soft key to get to the BITS menu
- In BITS scroll until GFP is highlighted
- Use the up and down arrow keys to toggle between on and off
- Press ENTER to save

Wiring the Classic

WARNING: Shock hazard. Disconnect the batteries and input power before opening the Classic front cover

The Classic should be wired by a qualified professional and needs to meet all applicable electrical codes. Always make sure all source and battery circuits are de energized and wait 5 minutes before working on the wiring in the Classic. The Classic has 2 common neutral (negative) terminals. Therefore, only one neutral conductor is required to run from the E-Panel and terminate on either (or both) common neutral terminal. The Positive DC source wire goes to the PV+ Turbine+ screw. The Positive Battery DC wire goes to battery + terminal. Torque the terminal screws to the specs below.

To connect the wiring to the Classic:

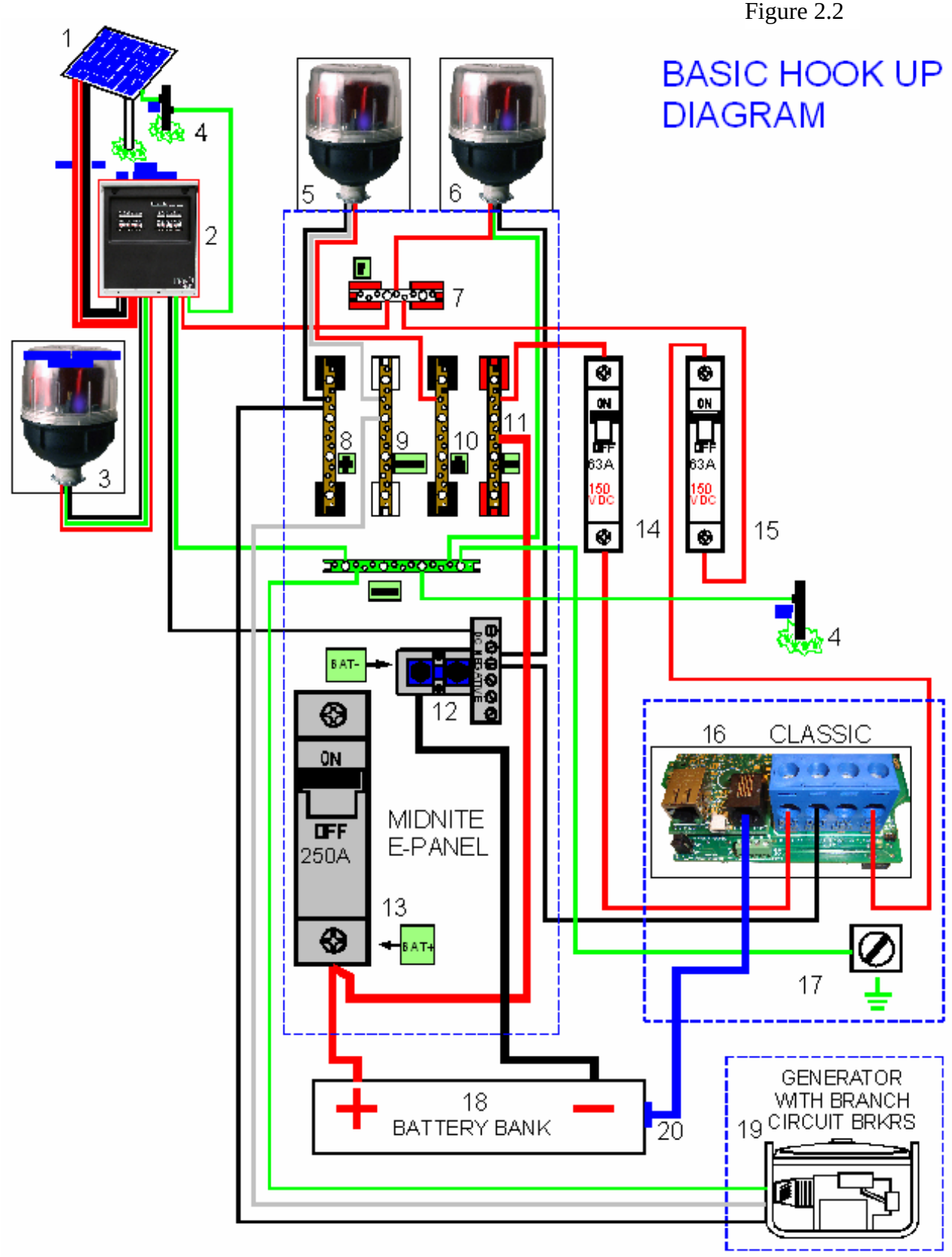
- Ensure the DC source and Battery are disconnected
- Connect a grounding conductor between the Classic and system ground
- Ensure the breaker between the battery and Classic meets UL489 standards.
- Ensure the breaker between the dc source and Classic meets UL1077 standards.
- Connect the DC source and Battery wire to the Classic
- Connect any communications cable or auxiliary input/output wires
- Torque terminal connector screws to the following specs

The Torque specs on the DC terminal connector (big blue terminal connector) are:

- Up to #10 AWG torque to 25-35 inch pounds.

- #8 AWG torque to 30-40 inch pounds.
- #6 AWG or above. Torque to 40-50 inch pounds.

Figure 2.2



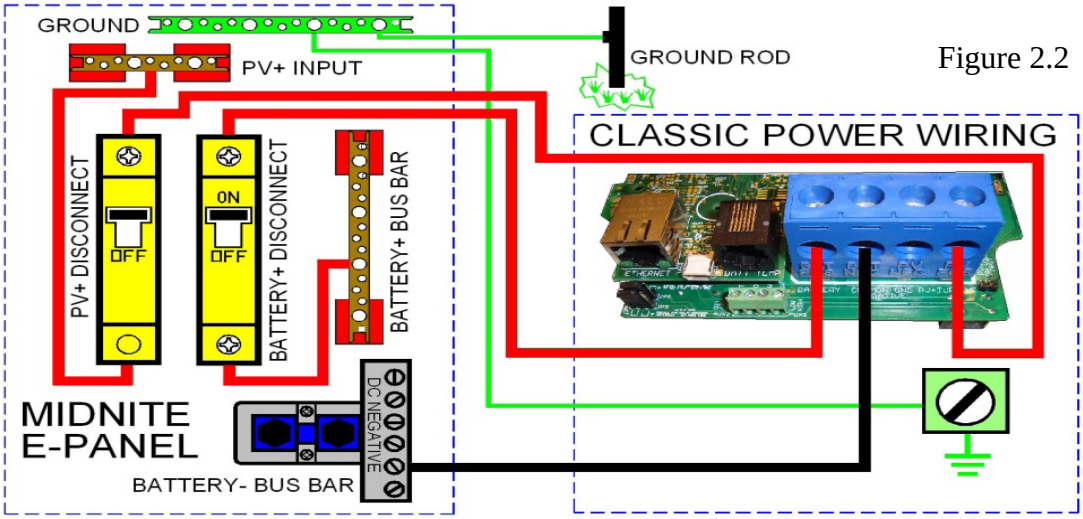


Figure 2.2

DC Terminal Connector

Figure 2.4

The Classic's DC terminal connector is located on the circuit board as shown in. The connector will take up to a #4 AWG. 4AWG THHN wire when installed in the Classic. The MidNite E-Panel is rated for over 100 amps and is therefore suitable for the highest power Classic 150.

Over Current Protection and Wire Size Requirements

The over current devices, wiring, and installation methods used must conform to all electrical codes applicable to the location of installation. Wiring needs to be protected with proper strain relief clamps and or conduit. See page 49 for a breaker and wire size chart.

The network cables, USB cable, BTS cable and auxiliary input/output cables should run in a different conduit to preserve their signal. When installing the Classic in a MidNite E-Panel, it is acceptable to run all wiring through the same knockout hole. It is legal to run signal and power wires together as long

as all wiring is listed for the highest voltage to be encountered.

Current Rating

The Classic limits the output current to the maximum for the model you have.

The Classic current ratings are:
Classic 150v - 96 amps maximum
Classic 200v - 79 amps maximum
Classic 250v - 62 amps maximum

Temperature Current Limit

The Classic has a current limit component which interacts with the temperature of the charge controller. If the Classic is exposed to extremely hot ambient conditions the out put current will be reduced automatically to keep the charge controller safe, if the orange LED comes on, on the MNGP it means that the Classic is in current limit mode. If you believe the Classic is not hot and the orange LED is on, most likely the current limit set point is too low. To check this follow steps bellow.

- Press Main Menu
- Highlight CHARGE menu and press the Enter Button
- Press the upper right soft button
- Press the right arrow key to highlight Out Amps column
- Use the up and down arrow keys to change the current limit.

Over Current Protection

The Classic must have over current protection to protect wiring from over current events. A means of disconnect must be installed on the DC in and DC out of the Classic. Consult your local codes to determine over current ratings. The breaker between the battery bank and the Classic must conform to UL489. The breaker between the DC source and the Classic must conform to UL1077 or UL489. The NEC requires 1.56 times short circuit current for PV over current protection. This is reduced to 1.25 times when using a breaker rated for continuous duty. All MidNite Solar breakers are hydraulic/magnetic and are rated for continuous duty. No de-rating is required for the output breaker when using MidNite Solar breakers.

PV in particular will be capable of producing more current than its name plate rating in extreme situations so the safe minimum wire size should be selected for the PV array maximum short circuit current. Please consult PV manufacturer for specifications. The US National Electrical Code requires 1.56 times the PV short circuit current for wire size on the PV input. Output wire size follows the NEC guidelines. Typical wire size for output is 6AWG for the Classic250 and 4AWG for the Classic200 and 150 but check all de-ratings for your wire type and installation method.

Long Distance Wire Runs

The Classic offers some unique opportunities if you are faced with longer than normal wire runs between the DC source and the Classic. The Classic comes in 3 input voltage ranges letting you design a DC source at a higher voltage if it is beneficial. For example let’s say you have a 300 ft run from a PV array to the Classic you could wire for an open circuit voltage close to 250vdc accounting for the coldest temperature you will encounter. This will allow you to run a smaller gauge than with a lower

voltage charge controller. The efficiency of a high voltage Classic is less than the lower voltage versions, so you need to weigh the benefit. If this sounds too complicated use this rule of thumb in selecting the proper Classic. PV runs up to 100 feet, use the Classic 150. Runs up to 180 feet, use the Classic 200. Above 180 feet use the Classic 250 or 250KS.

If the wire size between the DC source and the Classic is larger than the Classic's DC terminal connector you can use a splicer block or similar connector to reduce down to #4 AWG close to the Classic. The MidNite E-Panels are supplied with a PV input busbar that accepts up to 1/0 wire.

Maximum and Minimum Wire Size

The Classic DC terminal connector will accept wire from #14-#4 AWG

Connecting the Classic to the Clipper

The Classic will work in conjunction with either of the MidNite Solar Clipper's when available. To connect the Classic to a Clipper you need to plug a MidNite network cable (standard 6 conductor phone cable) into the jack labeled MASTER/IN Clipper and the other end into the jack labeled SLAVE/OUT on the Classic. The DC output of the Clipper will go to The DC input terminals on the Classic. Refer to the figures below.

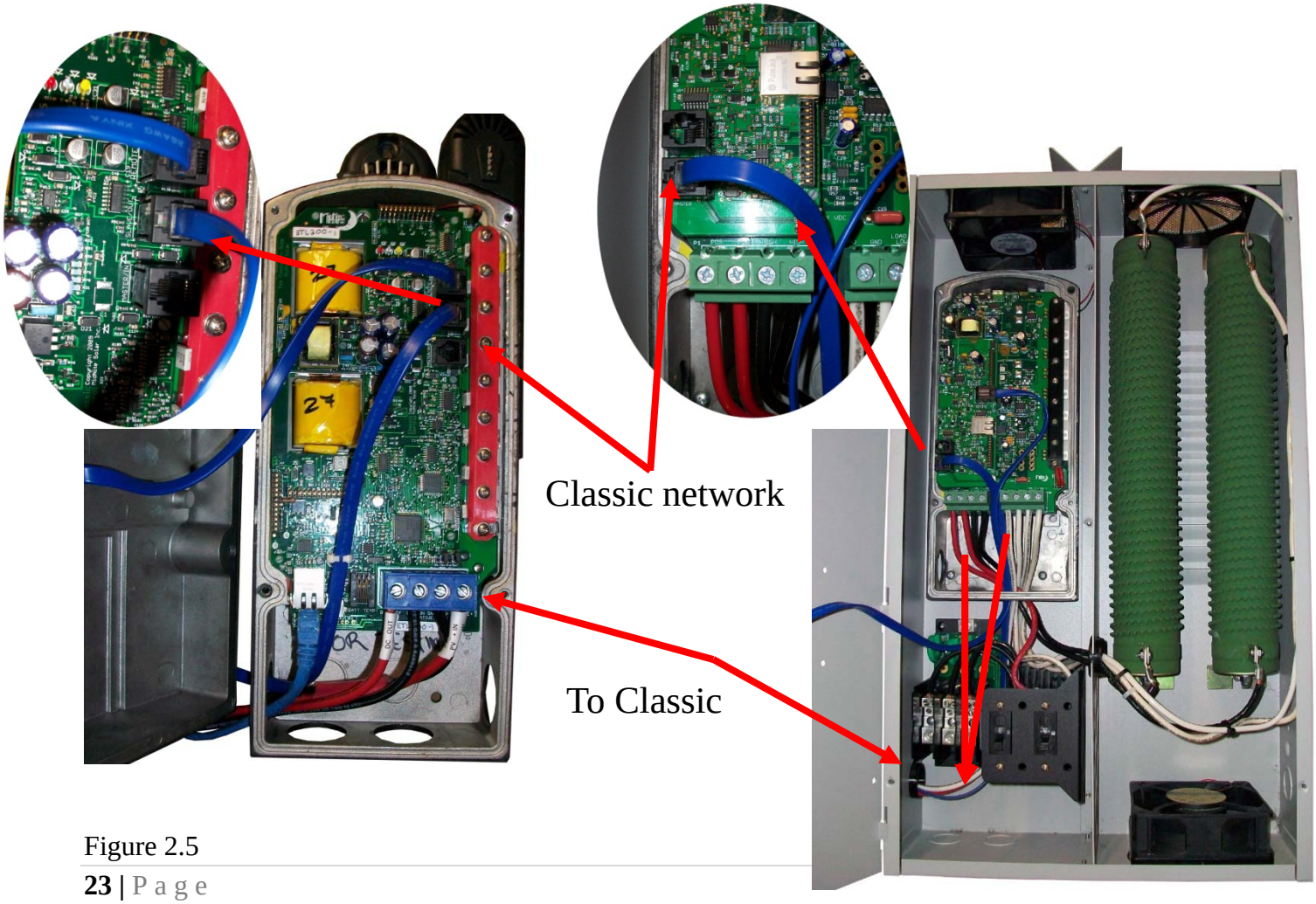


Figure 2.5

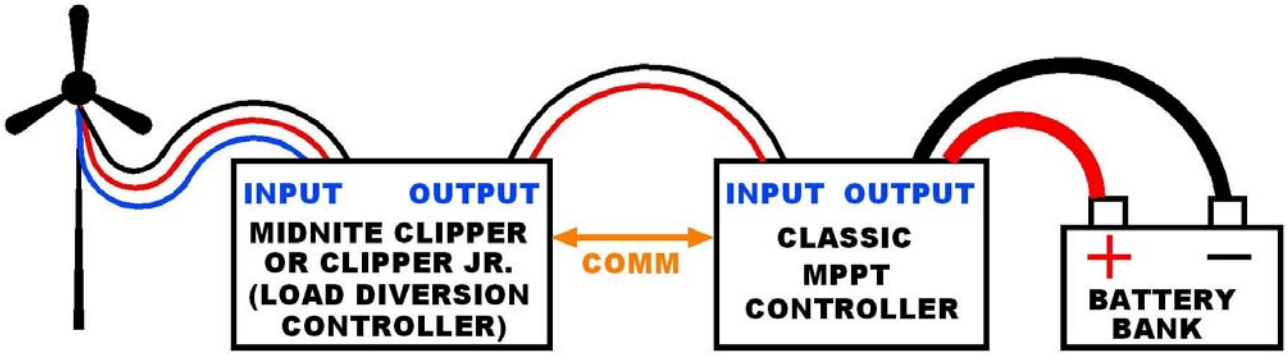


Figure 2.6

Commissioning the Classic

The Classic will enter into the setup wizard upon initial power up. If the Classic does not enter into the setup wizard or you want to enter the wizard at any time follow these steps to get into the setup wizard.

- Press the Main Menu button.
- Scroll Left or Right until Wizard is highlighted and press the Enter button.
- Follow the on screen instructions through to the end.

Using the Classic Setup Screen's

The Classic setup wizard will walk you through the set up process. Below is a description of the steps.

DO YOU WANT PASSWORD ENABLED? PASWORD WILL BE 142 YES NO	Sets the password On Classic Settings
CONNECTED TO CLASSIC 150	Tells you which classic model it is
IS THIS A GRID TIED SYSTEM (BATTERY BACKUP) YES NO	This menu will determine how to treat batteries differently. sealed batteries lower voltage for grid tied
TIME DATE 24:00:00 01/10/2010	Set time and date, this is important because Classic will automatically know at what time to wake up and go to sleep mode (**Sunrise/sunset using Astronomical formulas**)
BATTERY CHEMISTRY FLOODED LEAD ACID ENTER	Sets up battery temp compensation and absolute maximum charge voltages regardless of temp
BATTERY BANK VOLTAGE 48	Selects between different voltage configurations on the system, increments of 12 volts (12v, 24v, 36v, 48v, 60v, 72v)

DO YOU KNOW THE BATTERY BANK AMP HR CAPACITY YES NO	Helps set Absorption time and EQ defaults
WHAT IS THE VOLTAGE OF AN INDIVIDUAL BATTERY 6	This is necessary for the set up software to help figure out battery capacity
SET CURRENT LIMIT 80 ENTER TO CONTINUE	Sets classic's max output current
CONTROLLER MODE SOLAR WIND HYDRO SCROLL < > TO SELECT THEN PUSH ENTER	Selects classic's mode. This can be changed in the mode menu
STC MODULE POWER 210 ^ WATTS	Photovoltaic module power rating
STC VOC RATING 44.3^ VOLTS	Photovoltaic module voltage rating
STC ISC RATING	Photovoltaic module current rating

Setting Nominal Battery voltage

Upon initialization the Classic will display battery
To set up the Classic to a preset battery voltages (e.g. 12v, 24v… 48v) follow the steps below.

- Press Main Menu
- Scroll to the left until Charge is highlighted and push the Enter button
- Highlight Volts and press the Enter button
- Press the Right soft key
- Scroll up and down to select the desirable battery voltage

Battery Charge Stages and Meanings

Bulk MPPT

This stage of the Classic means; that the Classic will be putting out as much current as it can trying to charge the batteries to the absorb voltage set point. This is also known as constant current mode.

Absorb

This stage means that the Classic will maintain the absorb set point voltage until the batteries are charged or it reach Float stage. At this stage the classic is not putting out maximum current, as that would increase the battery voltage over the Absorb set point. This is also referred to as constant voltage mode.
The absorb time is proportional to the bulk time. (i.e. the time bulk takes to reach the absorb voltage.) The battery it's considered "full" at the end of the absorb charge cycle.

Float

A *Float* cycle follows after the *Absorb* cycle is completed; *Float* is displayed on the screen. Battery voltage is held at the float voltage set point, float time can be changed by the user.

Equalize

Equalization function has to be enabled by the user, refer to page 25. The intent of an equalization charge is to bring all battery cells to an equal voltage by a deliberate overcharge. The goal is to return each battery cell to its optimum condition through a series of voltage controlled chemical reactions inside the batteries.

Adjusting Absorb, Equalize and Float Voltages

Setting the Classic though the wizard will set Absorb, Float and EQ to the factory default set voltage to the specified battery type. (E.g. Flooded Lead, Gel...) These voltages are fully adjustable, just follow the steps below.

- Press Main Menu
- Scroll to the left until Charge is highlighted and push the Enter button
- Highlight Volts and press the Enter button
- Use left and right arrows keys to highlight the set point voltage to adjust
- Use up and down arrow keys to lower or raise the voltage
- Press the Enter button to save the new voltages.

Battery Size and Chemistry

The Classic supports a variety of battery chemistries including; Flooded lead acid, sealed – AGM, gel cell and Nickel Cadmium. These different types of batteries have different charging parameters. These parameters are crucial for long- time battery life. Go through the WIZARD to select the battery type of your system. If you replace the batteries for a different type make sure you change the type on the WIZARD. That is the only place where the battery type can be changed.

Battery Temperature Compensation

The Classic comes with a battery temperature sensor (BTS). This sensor raises or lowers charge voltage based on temperature. Connect BTS to the BATT TEMP jack. *(Refer to fig 1.7B and 1.9)* Battery temperature menu appears as **T-Comp** in the BATTERY MENU. In this menu you can change the voltage compensation as needed. If the BTS is disconnected or shorted the Classic will automatically use the default charge voltages non-compensated.

Calibrating Battery and PV Voltage

To calibrate the Classic battery and PV voltage reading, you will need a Volt meter to check the actual battery bank voltage or input PV voltage. Using the volt meter measure the voltage on the DC terminal connector of the Classic (refer to Figure 2.4) compare this reading to the reading on the Status screen in the Classic,(press Status if not in this screen) to adjust the reading of the Classic to the one in the volt meter follow these steps:

- Press Main Menu, scroll to TWEAKS and press Enter
- Highlight VBatt and use the up and down arrow keys to match both of the readings
- Press the Enter button to save

Note. Use the description below to help complete the calibration of the Classic voltages.

TWEAKS screen

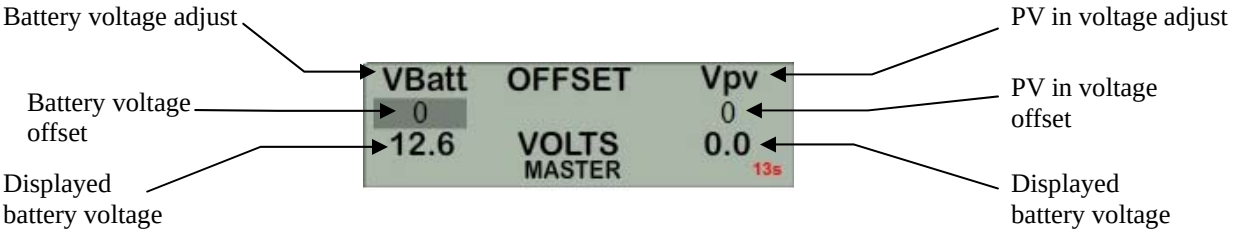


Figure 2.7

Configuring DC Input Source

To select the Mode the Classic will run in, follow the steps below.

- ❖ Push the Main Menu button.
- ❖ Scroll left or right until Mode is highlighted and then push the Enter button.

The ON/OFF has to be set to OFF in order to change the operational mode. Scroll to the right to highlight the word ON or OFF and use the up and down keys to change it to OFF. Push the Enter button to save this change. Now you can scroll to the right and highlight the mode under Function. Scrolling up or down changes the modes. Once a mode is selected push the Enter button to save this change. Then you can use the right soft key to select “setup”. This would be where you will manually set up any parameters specific to the mode you selected.

Configuring the Classic for Photovoltaic Input Source

The Classic has more than one mode to be used for Photovoltaic arrays; USET, O&P Solar, PV LEARN and Solar 1.

PV LEARN

This is the ultra-fast, Maximum Power Point tracking mode. It finds MPP in less than half a second with a precision of +-5 watts; this is the default solar mode. Use this mode except in special cases. To select this mode just select PV LEARN from the list in the MODE Menu.
There is one parameter of this mode which can be configured.

- ♦ *Interval*- In minutes. Is the maximum amount of time in between sweeps. We recommend to set the time to 15 min. let the Classic figure out if the input power has changed, in which case the Classic will automatically sweep for a new MPP.

1 Note. Setting Interval to 0 will set the Classic to only do an initial sweep down to battery voltage when turned ON. However it will still do automatic sweeps.

2 Note. The Classic does automatic sweeps thought out the day to optimize maximum output power. Every time there is a change in the input power of more than 10% the Classic will do a sweep, this could be caused by a cloud passing by or shadows of a tree branch.

U- SET voc%

U- SET Lets the user pick the VOC % meaning that for any specific reason the VOC should stay constant it will, only while in BULK MPPT charging state, after going to absorb or float VOC% will change to

maintain the batteries at their absorb voltage set point. (See pg. 31) This mode will not automatically find Maximum Power Point. U-SET will also let you do an interval. But it is utilized differently. To set Interval time or to set VOC% do the following:

- Press main menu and scroll to MODE, press Enter
- Highlight ON/OFF and select OFF
- Scroll to the right and press the up and down arrow keys to select from the list of input modes
- Highlight the mode you wish to use and press the right soft key to enter the setup window
- Use the left and right arrow key to select the parameter to change
- Press the up and down arrow keys to adjust
- Press Enter to save

SOLAR 1 O&P

Same as PV LEARN, this mode will automatically do a sweep down to just a couple of volts above battery voltage to find the MPP but in variation will take longer to do this sweep. This mode makes use of a much different method to obtain the MPP. In the Setup menu you can select how often it does a sweep. *Interval* can also be set in this mode.

Configuring the Classic for Wind Input Source

Wind Track

If you selected “Wind Track” you will need to select a power curve from the list of pre-loaded curves or build your own. To access the list of power curves follow the steps below.

- Push the Main Menu button.
- Scroll left or right until “Mode” is highlighted and push the Enter button.
- Set the status to OFF and then use the right soft key to select “Graph”.

Using the left soft key select “MEM”. Now you can scroll up and down through the menu and select from the curve that was designed for your turbine. Once you find the correct power curve use the right soft key to select “RECALL”. Now push the Enter button to save this power curve to the Classics memory.

There are also 9 memory spaces for you to save a custom power curve. To build custom power curves select a memory location between 1 and 9 and hit “RECALL”. Use the right and left arrow buttons to scroll through the 16 steps in the custom curve. On each step you can set the amperage by using the up and down buttons. When you have the power curve the way you want it select “MEM”. Use the up and down buttons to select a location 1 through 9 to save it in and select “SAVE”. Now push the Enter button to save it to the Classic's memory.

For more information consult the videos contained in this DVD as well as the MidNite Solar web site. *Classic-Wind-Graph-Editor-1.mpg*

Setting the Date and Time

To set the date and time manually on the Classic follow the steps below.

- Push the Main Menu button.
- Scroll left or right to highlight “TIME” and push the Enter button

Now scroll left or right to highlight the data you want to manually change. Use the up and down buttons

to change the data. When you have all the data changed push the Enter button to save the changes.
The Classic includes a battery in the MNGP portion, to keep the time running even when the power is disconnected. To replace the battery refer to the Installation Manual

Setting Longitude and Latitude

With the built in virtual map, you are able to select where you are in the world. For a more precise setting you can manually enter the longitude and latitude coordinates, geographic location is important because it helps determine when the Classic wakes up and when it goes to sleep. This setting tells the Classic when sunrise and sunset are to happen. The Classic will use this information on future features also. To set longitude and latitude coordinates you need to go thought the WIZARD that is the only way to gain access of this feature

Configuring Auxiliary Input/Output

The Classic includes two auxiliary ports which can be configured to become inputs or outputs. These aux ports can be used as a secondary power supply to be used for accessories such as vent-fan, anemometer and generator starter or even and anemometer. These aux ports if used correctly could extend the system life. Here is an explanation of how they work.

- An internal, re-settable Positive Temperature Co-efficient (PTC) fuse protects the AUX internal components from overcurrent or a short circuit.
- AUX 1 consists of either RELAY or LOGIC operation depending on the user selection function.
- AUX 2 could be set to become an INPUT or OUTPUT. One at a time this port could be reading the state of a device connected and takes an action from there.

To configure the Classic's Aux ports:

- Push the Main Menu button
- Scroll left or right to highlight “AUX” and push the Enter button.

Scroll left or right to highlight the relay you wish to change. Push the right soft key labeled “SETUP”. Scroll up or down to change the function of the relay. Select the right soft key to set the parameters of the function. When finished push the ENTER button to save the changes.

Main Aux Screen shows both Aux1 and Aux2 functions

Table 2.0

Off -	Places output to Low state (0 Volts)
Auto -	Selects the assigned function to the Aux output or input
On -	Sets output for Low state (12 Volts or Relay On)

Aux 2... Used with a SSR relay a FET type of SSR for the DC side should be perfect here. You can set the

diversion threshold V to either be absolute, (pick a voltage), or a voltage relative to the particular charge stage the system is in at the moment... (Absorb, EQ, Float) This diversion mode can be adjusted to start diverting (Pulsing or "Buzzing") at (0.0V) or above / below the present battery set point voltage (absorb, float, EQ). You most likely will want to adjust it slightly below the set point voltage.... For example, -0.3 Volts. There is also a voltage "width" adjustment, the voltage width being the range where the PWM goes from a short pulse, beginning right at the charge set point voltage, and full on at the diversion set point voltage "plus" the width voltage. For example, if the Controller is presently Absorbing (voltage regulating) at 14.5 Volts and the Aux 2 Relative threshold voltage is set for -0.3 Volts, the Aux 2 diversion PWM pulsing or "buzzing" will start to become ACTIVE when the battery reaches 0.3 Volts below 14.5 volts.... (14.2 Volts and if the Width adjustment is at 1.0 Volts)... The Aux 2 diversion output would be fully Active (not pulsing anymore) at 14.3 V ~PLUS~ 1.0 Volt or, 15.3 Volts. This voltage width gives the PWM diversion function some "room" for the SSR and loads to work. How much of that voltage width is actually used depends on the value of the load resistance and the amount of power available from the source (PV or turbine etc.) If the diversion load resistance is not low enough, it will not be able to load down the battery enough and will more likely approach the full voltage width.... The higher the diversion load is, (lower resistance), the less width will be used. This leaves some room for more available power to be diverted. However, the diversion load resistance doesn't want to be TOO low, or the diversion operation won't work quite as smoothly as it would if it has SOME room to move about.

Aux 1 diversion mode is similar to Aux 2 diversion mode except that it does not PWM, Pulse or buzz at hundreds of Hz rate. Instead, Aux 1 diversion goes Active at or above the "High" voltage setting, after a programmable "Delay" time, and goes Inactive when the voltage drops below the "Low" voltage setting after a programmable "Hold" time. These Delay (or Attack) and Hold times are adjustable in 0.1 Volt increments.

The Aux Relative Voltage adjustments are referenced to the temperature compensated Absorb, Float or EQ voltage. In the Classic, the EQ regulation voltage can be chosen to be either battery temperature compensated or not. This choice is picked in the Charge -- Temp-Comp menu.

In battery relative diversion mode, when either Aux outputs go "active", either solidly for Aux 1 or pulsed for Aux 2, you can choose to keep the charge timers and counters running (or not) for the Absorb and EQ stages so that the controller will go to Float when that charge stage is finished (its timer has expired). This could be important, because the diversion might be holding the battery voltage below the desired set point voltage for that charge stage. As long as the Relative diversion threshold voltage and absolute Absorb, Float and EQ voltages (charge menu) are chosen with some degree of thought, using the diversion in concert with the normal "raising the input power source voltage" method to regulate battery voltage, can work very well for battery charging cycles. You might want to set the absolute a few tenths of a volt higher than usual so that the diversion mode can be used to greater benefit. This will help to ensure that if the diversion loads go away, the battery voltage won't go TOO much higher than desired and battery over-gassing would be minimal. Using diversion in this way is what we call "Use It Or
Lose It" mode (Ui-Loi)... Just think of the song, "Louie-Louie".

For Relative diversion using Aux 1 or Aux 2, the default to keep the charge timers running will be enabled.

Aux 1 and Aux 2 outputs can also be chosen to be "Active High" or "Active Low"... Active "High" is the normal mode of operation and means that the Aux output will be at 0 Volts (ground) when Off and 12 Volts when On... Low, being 0 volts and High being 12 volts. Active High is shown in the Aux menus

with a "+" sign following the mode name and Active LOW mode with a "-" following the name. The output voltage for a High is actually more like 14 or 15 Volts DC and can supply up to 200 milli-Amps of current.

Aux 1 also has a (small) relay that can be jumpered into the circuit if an isolated switch is needed. This might be used to start or stop a generator. Remember though that this is a very small relay with 1 Amp rating and a series 1/2 Amp re-settable fuse in series with it to help protect its contacts.

Aux 1 Function

OUTPUT = Relay or 12V/0V Signal jumper selectable
Aux 1 has the relay so Diversion functions must operate slowly

Table 2.1

DIVESION SLW+	Battery diversion using contact relay. Active high
DIVESION SLW-	Battery diversion using contact relay. Active low
BAT DIV V REL+	Battery diversion relative to charge stage voltage. Active high
BAT DIV V REL-	Battery diversion relative to charge stage voltage. Active low
PV V TRIGGER +	Input voltage controlled. Active high
PV V TRIGGER -	Input voltage controlled. Active low
MANUAL ON-OFF	Manual button on- off control.
TOGGLE TEST	Output toggle once per second

Aux 2 Function. Output/Input

Table 2.2

DIVERT DGTL F+	Battery diversion controlled by PWM. Active high. *Output*
DIVERT DGTL F-	Battery diversion controlled by PWM. Active high. *Output*
BAT DIV V REL+	Battery diversion relative to charge stage voltage, controlled by PWM Active high. *Output*
BAT DIV V REL-	Battery diversion relative to charge stage voltage, controlled by PWM Active low. *Output*
PV V TRIGGER +	Input voltage controlled. Controlled by PWM Active high. *Output*
PV V TRIGGER -	Input voltage controlled. Controlled by PWM Active low. *Output*
MANUAL ON-OFF	Manual button on- off control. *Output*
TOGGLE TEST	Output toggle once per second. *Output*

To set/ change threshold voltage as well as time do the following:

- When in the function you wish to use press the right soft button
- This will take you to the VOLTS menu here is where you set your threshold voltage
- Use the left and right arrow keys to navigate through the options
- Use the up and down arrow keys to raise or lower the threshold voltage
- To change the time press again the right soft button to get to the TIME menu
- In this menu do the same as you did in the VOLTS menu, until desired adjustments are made
- Press ENTER to save

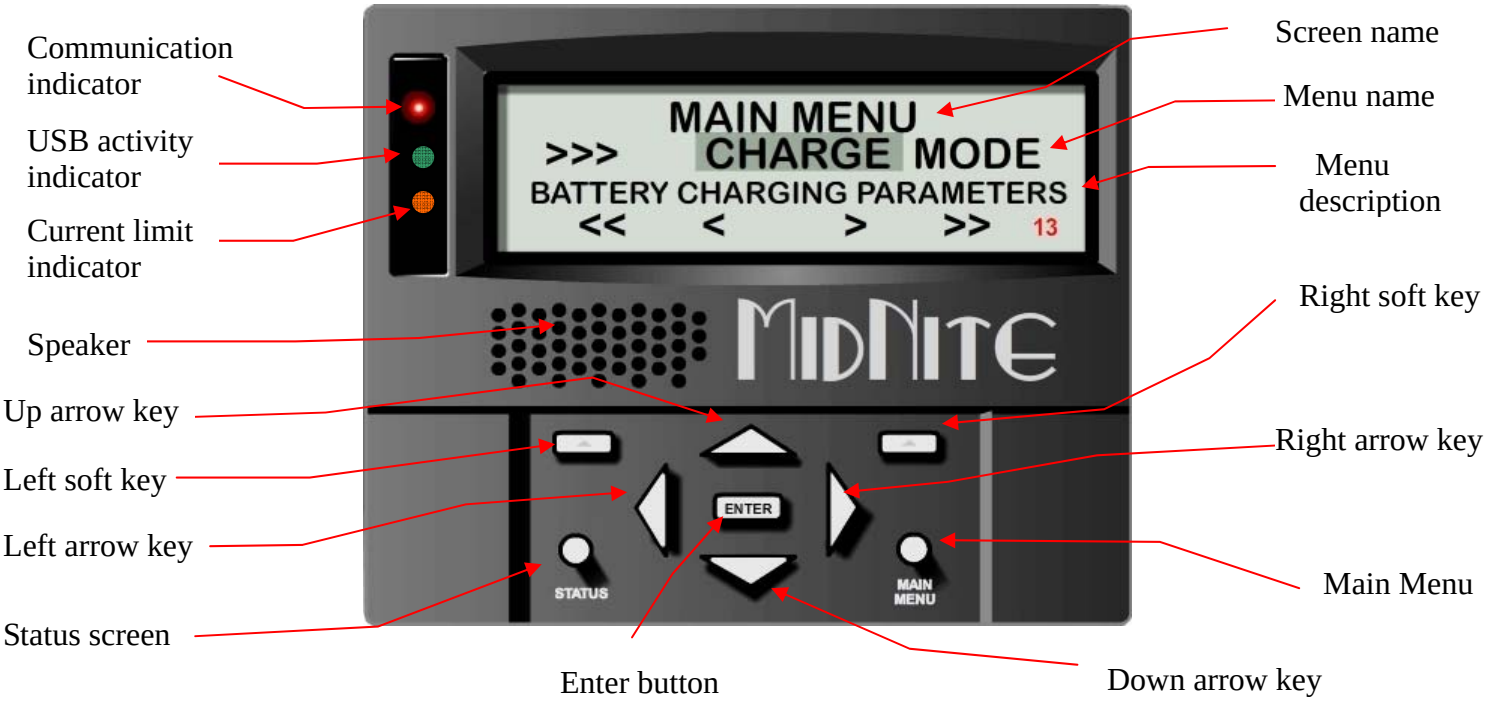
Setting the MNGP features, Access the Version of software and Restore factory defaults

The Classic comes with an integrated “MidNite Graphics Panel” (MNGP), which is the primary interface to the Classic. Setting up contrast, backlight and volume its simple just follow the steps below.

- Push the Main Menu button.
- Scroll left or right to highlight “MNGP” and push the Enter button.
- Use the left and right arrow keys to select the feature to set and press the Enter button
- Press the up and down buttons to adjust
- Press Enter to save

Use diagram below for MNGP reference. Figure 2.8

Figure 2.8



Operating the Classic

Once the parameters have been set via the set up wizard or from manual set up, there are no further requirements to make the Classic function. It is all automatic.

Navigating the Menu's

- Push MAIN MENU
- Push right and left buttons to see the different menus
- To return to the status screen push STATUS button

* To navigate from one end of the main menus to the other end push the top right and left buttons

When the Classic first turns on it will take you through the WIZARD setup. After all of these parameters are set **and saved**, you will be placed in the MAIN MENU screen with WIZARD highlighted. Below the name of the menu is a description of the menu. Pushing the left and right buttons will enable you to see all the main menus provided. Inside some of these main menus will be sub-menus to adjust the parameters of the selected feature.
Here is an overview of these menus:

<<WIZARD— CHARGE —MODE—AUX—MNGP—LOGS—TWEAKS—TEMPS—NET>>

Below each of the menu names is a row with a description of the menu inside. To enter a menu, the name of the menu has to be highlighted. Pushing ENTER will show the submenus. The up and down arrow keys are enabled for easier navigation. Highlighting a sub menu and pushing ENTER will take you inside the submenu where you will be able to change the parameters of the unit. To get out of the submenus push MAIN MENU, this will take you out of the submenus one at a time every time you push it. See page 44 for entire Menu Map.

Viewing Other MidNite Products on the Display

The Classic is able to view other products or Classics connected to the network. For example: the MidNite Solar Clipper. To view other products or Classics connected to the Classic network, go to the Status screen and press the UP and DOWN arrows to scroll between the addresses of the different items. The Classic is address 10 and labeled. CLASSIC

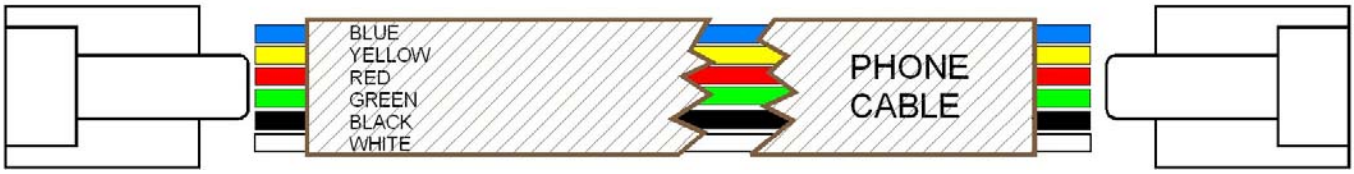
Connecting Classic to Two MNGPs/Network cable

The Classic can be controlled with two MNGPs at the same time. This will help when the Classic is in a shop and there is a considerable distance between the Classic and the controlling point (office, inside house, garage etc.). Instead of going to the Classic to check status or to change a setting, the user can run a cable to the controlling point and see the Classic in a second MNGP. The cable is a six wire phone cable. Connect one side of the extension cable to the jack in the Classic labeled SLAVE/OUT and the other end to the second MNGP. Since the Classic transmits power and data signals through the phone cable to the MNGP the length of the cable is limited to 100ft.

MidNite Solar only offers a 3ft as an optional accessory. If you are making your own cable be sure be sure to insert cable end all the way into the phone terminal to get a good contact. Use the phone crimping pliers to crimp both ends of the cable.

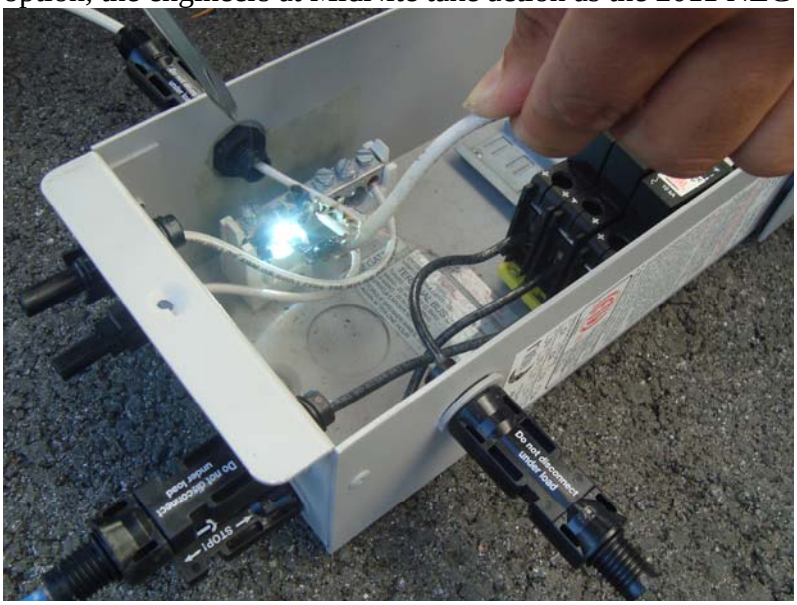
We recommend using flat phone cable for extension, just

because it is easier to work with. Use the two pictures above as reference. Make sure the color and position of the wires are as shown in the diagram below. Use terminal connector tab as reference.



Arc Fault

The Arc Fault Detector is a unique safety component included in every Classic, because safety is not an option, the engineers at MidNite take action as the 2011 NEC code requires. The Classic is the first charge controller in the world to successfully stop a series arc. The Classic can detect an arc in less than 100mSec. From low power arcing to devastating high power arcing, the Classic will detect and shut down with an audible and visible alert to announce that there is a problem in the PV side of the system. When an arc is detected the Classic has to be manually cleared.



Resetting the Arc Fault Detector after detection has occurred: The First thing to do is find and fix the actual arcing wire, terminal, splice etc. The Classic needs to be powered down completely for 15 seconds and then powered back up. Do this by turning the DC source (PV, Wind or hydro etc.) breaker off. Then turn off the external battery breaker. Than simply turn the 2 breakers back on starting with the battery breaker.

The arc fault module has three adjustable parameters consisting of: MODE, TIME & SENSITVY
MODE: Is assigned as a 1 from factory default and it should stay that way unless instructed by MidNite Solar.

TIME: This sets the length of the arc the Classic has to monitor before tripping the Arc fault detection. This parameter is set to 4 from the factory.

SENSITIVITY: This parameter determines how sensitive the Arc fault detector will be 1 being the most sensitive and 15 the least. This parameter is set to 10 from the factory.

If you experience nuisance tripping you can raise the sensitivity one digit at a time. Follow the instructions below to make adjustments or disable Arc fault. As a last resort, you may disable Arc fault if your system cannot work with the arc fault detector.

To change the parameters of the Arc Fault, follow the steps below:

- Press Main Menu
- Scroll to the right or left until TWEAKS is highlighted and press ENTER
- In TWEAKS press the right soft key to get to the BITS menu
- In BITS press the right soft key to get to ARC ADJ
- In this menu use the left and right keys to select the feature to adjust
- Use the up and down arrow keys to change the parameters

In order for the Classic to read the new settings you must power cycle the Classic. Do this by turning the DC source (PV, Wind or hydro etc.) breaker off. Then turn off the external battery breaker. Than simply turn the 2 breakers back on starting with the battery breaker.

View Faults and Warning's

The Classic has some helpful safety features including the GFP (Ground Fault Protection) and AFD (Arc Fault Detector). When one or more faults are detected the Classic will stop outputting power and display a fault message in the bottom right corner of the home screen (STATUS). To clear the fault refer to Page 19 and page 33; Arc Fault section.

View Logged Data

The Classic can log the power produced by your system. Shown in Total kilo Watt hours (kWh), you can view daily logged data or accumulated throughout the life time of the Classic. Daily logged data is displayed in the bottom left corner of the Status screen; the daily logged data will get reset to 0 kWh every 24hrs. The total logged data is displayed in a menu screen called LOGS. Total logged data is an accumulation of all of the power that has been produced by the system; this data cannot be reset back to 0 kWh. To view total kWh produced by you system:

- Press Main Menu,
- Scroll to LOGS and
- Press the Enter button.

Uploading New Firmware to the Classic

There is also an Ethernet method for updating software in the Classic itself (Ethernet for MNGP Remote coming soon)

Up to this point the Classic cannot be updated using Windows 7®

There are 4 main things that need to happen to be able to update the Classic

1. Run and install MidNite-Update.exe
2. Successfully install driver
3. Both com port settings in Classic and in PC have to correspond
4. Have the Classic power off before opening the installed MidNite-Update program

Updating the Classic, is relatively complicated, this is because the user has to be able to directly interact with the computer up to a technical level.

1. To install the driver in your PC, first you need to run and install the MidNite-Update.exe (either from the DVD or download from www.midnitesolar.com). When prompted on the step in where

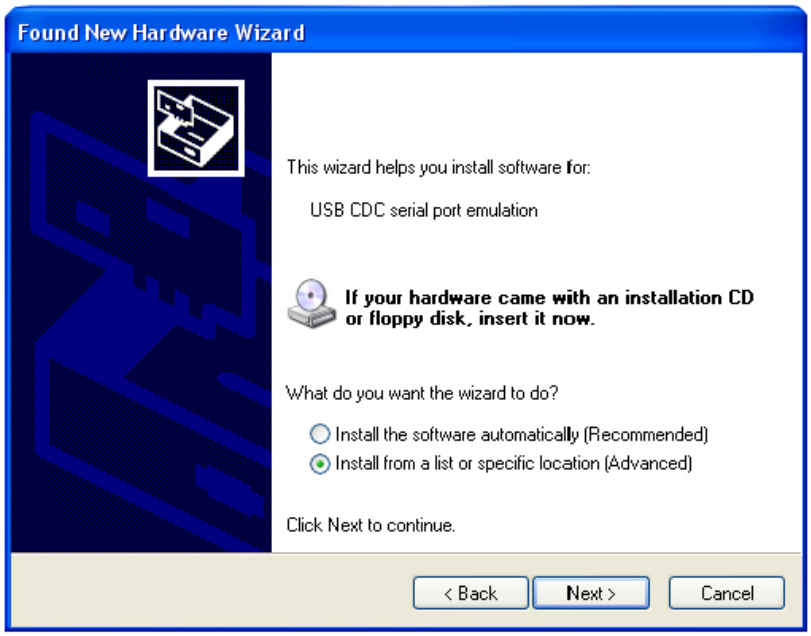
you specify where to install the folder, we strongly recommend installing in the default location; this will make next steps easier. C:*MidNiteSolar*

2. USB Installation for Windows XP

- With the Classic battery power ***on,*** plug the USB device into the computer, and Windows will automatically detect the connected device. This will begin the 'Found New Hardware Wizard'.
- The 'Wizard' will give the option to connect to Windows Update to search for software components, select: "No, not at this time".

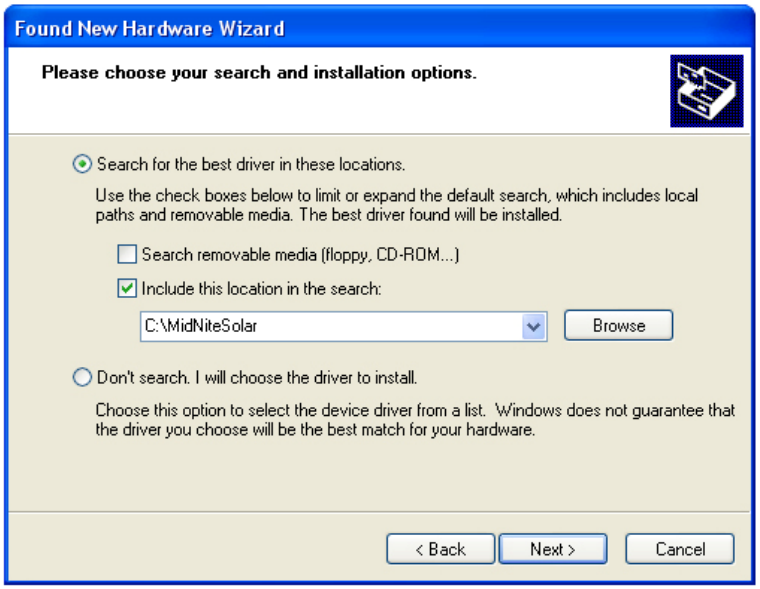
Note: On XP operating systems you should see a systray balloon popup showing that the device was connected as shown here:

After a few seconds you should see the "Found New Hardware Wizard" appear as shown below. Select the option titled "Install from a list or specific location (Advanced)" and click the Next button.


Found New Hardware Wizard
This wizard helps you install software for:
USB CDC serial port emulation
If your hardware came with an installation CD or floppy disk, insert it now.
What do you want the wizard to do?
Install the software automatically (Recommended)
Install from a list or specific location (Advanced)
Click Next to continue.
< Back
Next >
Cancel

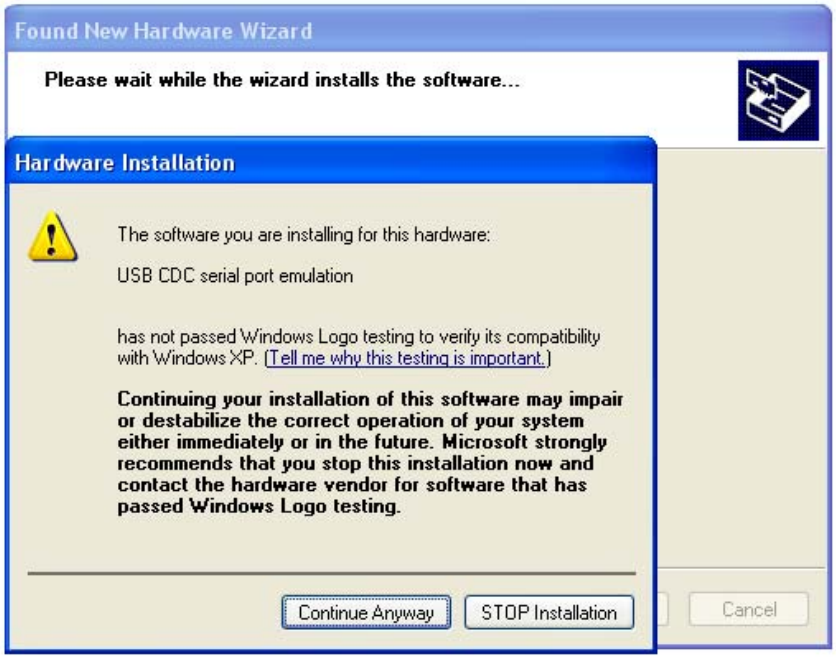
You should now see the dialog shown below. Insure that the "Include this location in the search:" checkbox is selected and hit the Browse button to navigate to the directory where the software was installed

Note: Your directory path will look like the dialog shown below if you did not change the default installation directory.


Found New Hardware Wizard
Please choose your search and installation options.
Search for the best driver in these locations.
Use the check boxes below to limit or expand the default search, which includes local paths and removable media. The best driver found will be installed.
Search removable media (floppy, CD-ROM...)
Include this location in the search:
C:\MidNiteSolar
Browse
Don't search. I will choose the driver to install.
Choose this option to select the device driver from a list. Windows does not guarantee that the driver you choose will be the best match for your hardware.
< Back
Next >
Cancel

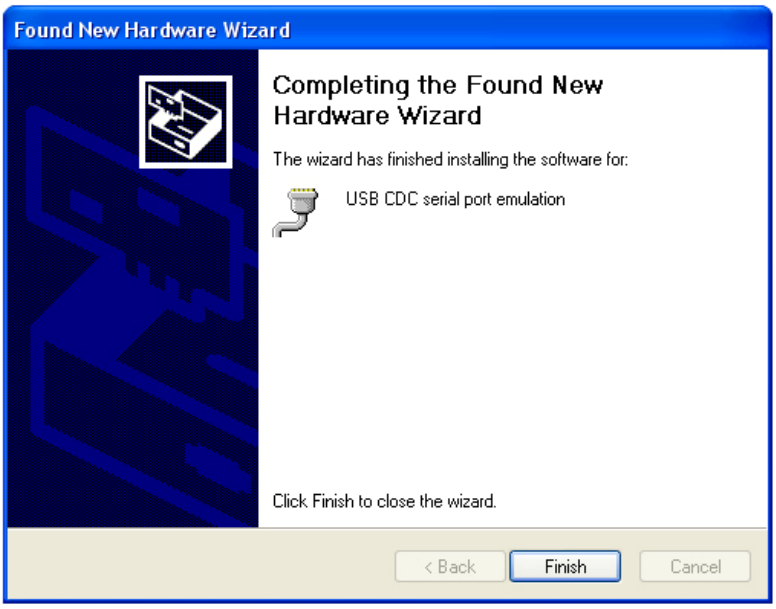
You will now get the warning dialog shown below because the driver for the USB chip has not undergone Windows Logo testing.

Just select Continue Anyway to proceed.


Found New Hardware Wizard
Please wait while the wizard installs the software...
Hardware Installation
The software you are installing for this hardware:
USB CDC serial port emulation
has not passed Windows Logo testing to verify its compatibility with Windows XP. (Tell me why this testing is important.)
Continuing your installation of this software may impair or destabilize the correct operation of your system either immediately or in the future. Microsoft strongly recommends that you stop this installation now and contact the hardware vendor for software that has passed Windows Logo testing.
Continue Anyway
STOP Installation
Cancel

The driver files have now been installed and your installation is complete.

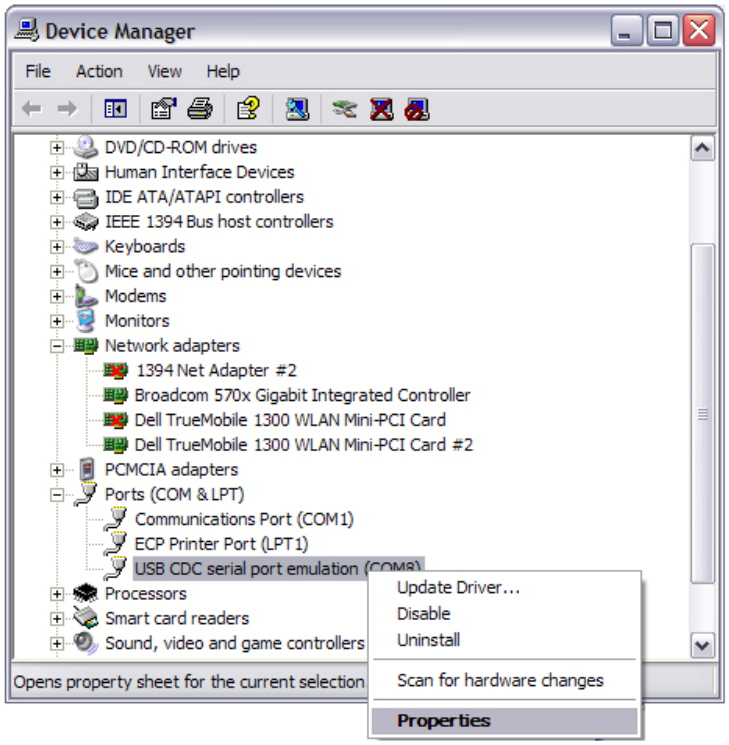
Select Finish to close the dialog.

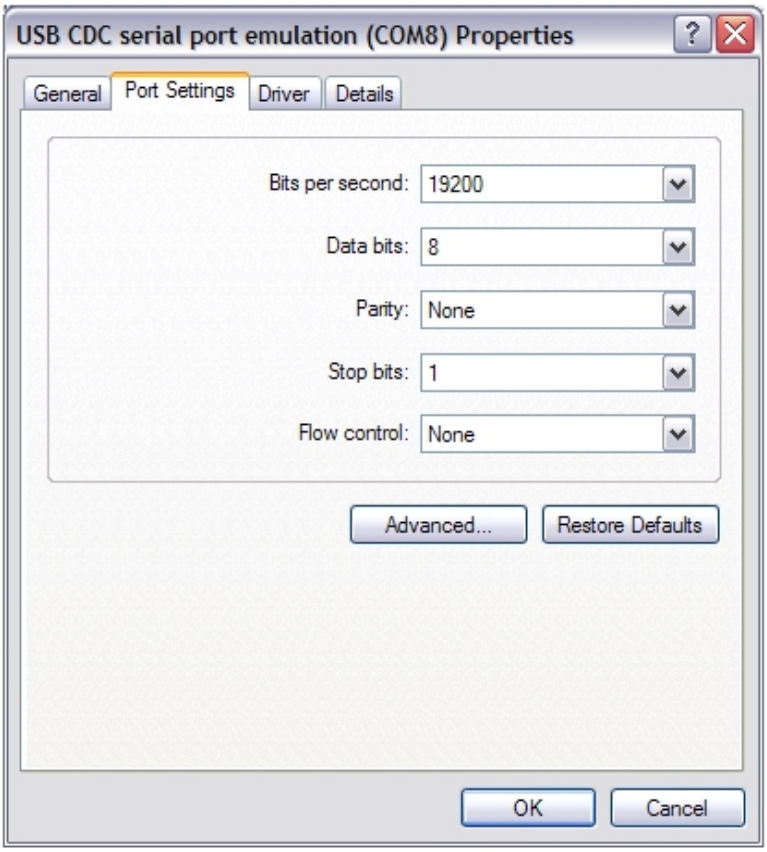

Found New Hardware Wizard
Completing the Found New Hardware Wizard
The wizard has finished installing the software for:
USB CDC serial port emulation
Click Finish to close the wizard.
< Back
Finish
Cancel

- Now a “New hardware has successfully been installed” bubble message will appear in the bottom right corner of the screen.

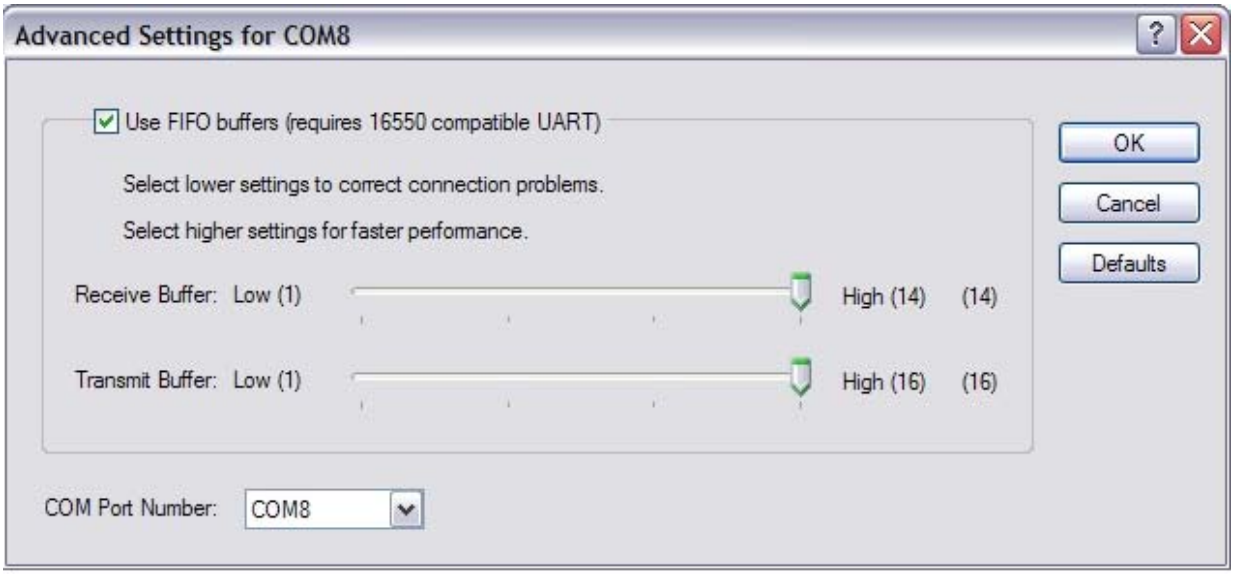
3. Change the COM Port Settings.

- To change the Port Number of the USB COM Port open Device Manager by *clicking Start -> Control Panel -> System (or hold down the "Windows" key and press "Pause-Break"* select the *Hardware* Tab and click the ***Device Manager*** button. Or
  Click Start -> Run... and enter ***devmgmt.msc***
- The ***USB CDC serial port emulation (COMX)*** is in the Ports section. To change the Port number right-click the USB Serial Device and select Properties
- Change the Bits per second to 19200





- Select the "Port Settings" Tab and click "Advanced"
- Select COM Port Number and change to COM8



- Click OK and close all open Dialogs.

Finished with this part!

Note. After running MidNite-Update.exe, (*first time only*), Windows will remember; every time a Classic is connected to the PC it will be set for COM Port 8.

4. NOW, you can power down the Classic and proceed to update its software using the MidNite Update program.
    - Go to Start, Programs and open MidNite-Update. **The Classic must be UN-powered at first when updating its software, even before opening the MidNite-Update program.** The *MidNite-Update.exe* program will give the basic directions on the bottom of the screen.
    - Under COMM FUNCTION you **must** select the correct Classic model or section you are updating. And click Upload.
    - Follow the instructions in the window.
    - After the upload status has reached 100% the window will automatically close, the Classic firmware has been successfully updated!
    - One last step, turn battery power ***off*** from the Classic and then turn it back ***on***. The first screen in the Classic should have a different date.

If you are updating the whole Classic including Networking and MNGP repeat step 4, for each one of the items being updated, just select the corresponding function under COMM FUNCTION to be updated.

For further information consult the “Read me” document contained in the MidNite-Update.exe installation. Or contact MidNite Solar.

Note. Check and compare the Classic about screen date to the date in the MidNite-Update.exe (see Menu Map for screen location) to check you are actually UPGRADING firmware, we don’t have a system yet that checks that you could be upgrading to an older version.

Connecting the Classic to the Internet

Networking

The Classic supports standard 10/100-base T Ethernet networks. For Gigabit networks you will need a common network switch that is capable of mixed mode operation. The Classic may also be placed on a, b, g, or n wireless networks by using a wireless network bridge device.
Depending on your network you may use one of the topographies detailed in Figures 5 – 5.3. Note that the switch may be self-contained or, in many cases, may already be integrated into your cable or DSL modem. Refer to Figure 1.7B for Ethernet connector location in the Classic.

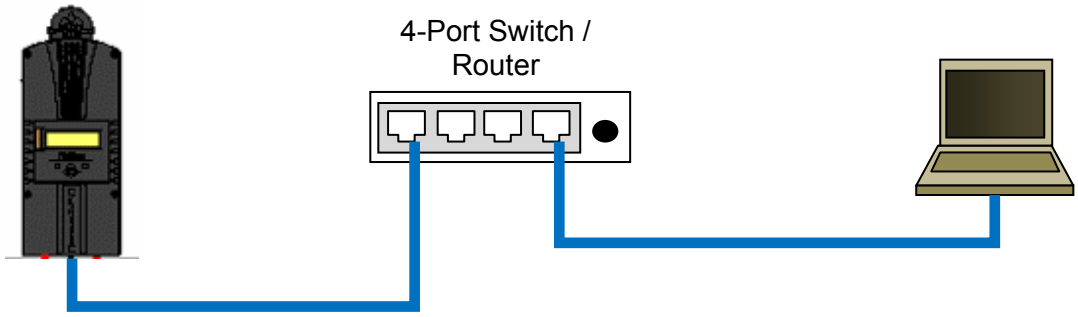


Figure 5 Local network through switch. In some cases you may be able to connect Classic directly to your PC; however, this is not a recommended topography.

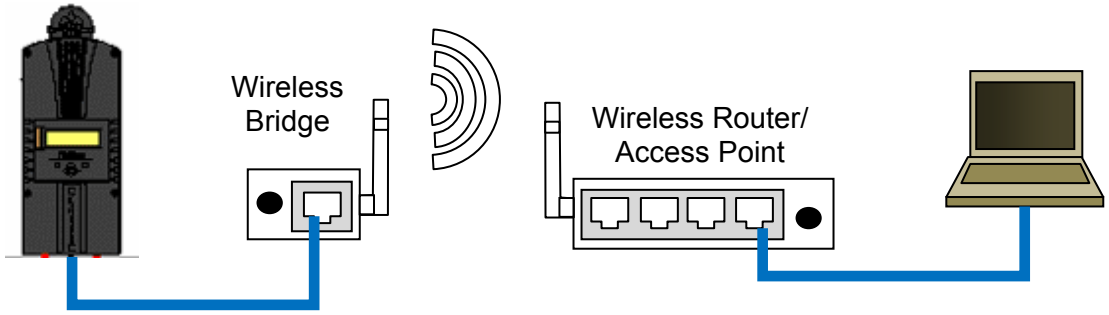


Figure 5.1 Local network through wireless bridge.

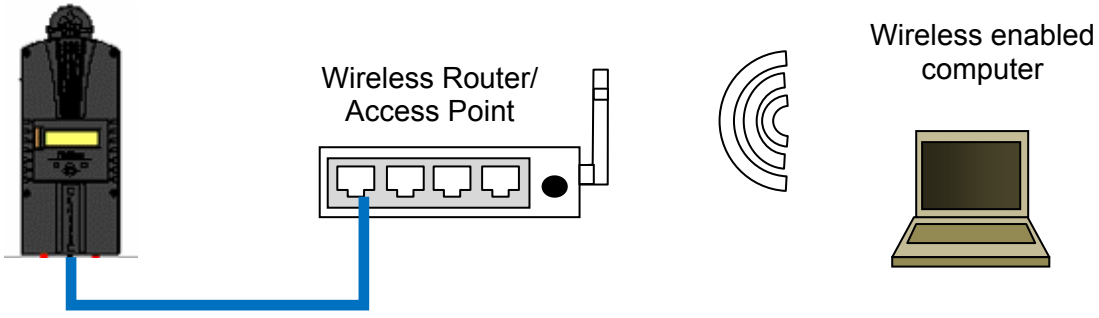


Figure 5.2 Local wireless network

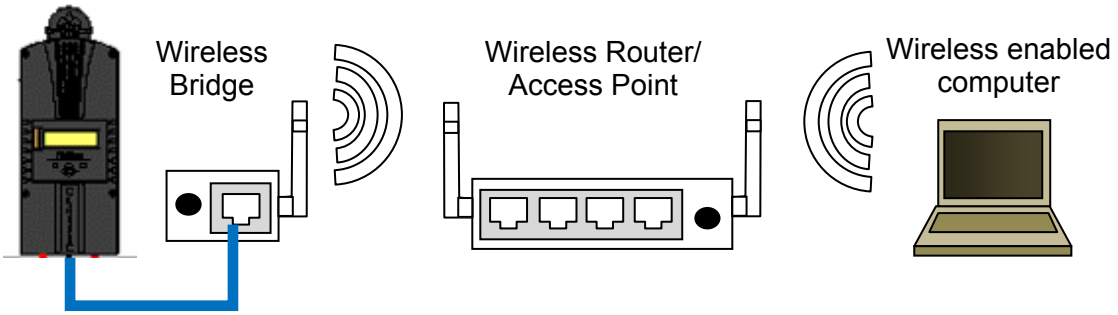


Figure 5.3 Local wireless network through wireless bridge

There are many different configurations possible when it comes to networking that are beyond the scope of this manual. The basic ones in the above figures should help get you going.

Network Setup Through the MNGP

The Classic's Ethernet capabilities may be configured using the Network menu on the MNGP. From the main menu select "NET".
There are three screens that configure network settings. Table TBD decodes the descriptions from the MNGP's small screen.

MNGP	Long-hand	Description
Mode	IP address configura-tion mode: DHCP/Static	The Classic supports both static and dynamically (DHCP) al-located IP addresses. If you are unsure which to choose try DHCP first. If you have trouble move to the troubleshooting section.
IP	IP Address	The Network address of the Classic
SN	Subnet	The Subnet or address class specifier
GW	Gateway Address	The address of the network's gateway device
D1	Primary DNS Address	Primary Address lookup device
D2	Secondary DNS Ad-dress	Secondary Address lookup device (optional)
Web Access	-	Enables or disables the Classic's online web service feature
MA	MAC Address	The hardware or Ethernet address of the Classic
DI	Device ID	The unique MidNite Solar address of the Classic

Table 5.1 Net Menu Details

DHCP

The Classic supports Dynamic Host Configuration Protocol (DHCP) in which all networking settings are derived from a DHCP-enabled router. This is the simplest configuration method and recommended unless you explicitly need a statically allocated IP address for your Classic. In this mode all other settings are automatically configured and are read only (informational) with the exception of the Web Access feature.

- Press Main Menu
- Scroll to NET menu and press the Enter button

- Highlight and select DCHP

Please note that the Classic's DHCP protocol implementation usually takes a few seconds up to a minute to update the network settings. If the network settings do not update within a minute, please consult the troubleshooting section.

Static IP

The Classic supports static IP address allocation. In this mode you can assign the Classic a specific IP address. This lets you set up things like port forwarding from your router or for networks with static IP allocations.

- Press Main Menu
- Scroll to **NET** menu and press the Enter button
- Highlight and select **STATIC**
- Using the left and right keys, navigate to the settings to change and use the up and down arrows to adjust the desired fields.
- Press the **COMMIT** softkey at any time to commit the settings to the Classic's Flash memory.

Please note that static settings span two menu screens. You may use the soft keys to navigate between the two menus. Pressing the **ENTER** key in either menu saves all settings to Flash memory.
For convenience when you manually set the device's IP address the Gateway and Primary DNS addresses follow the change. See the following sections for details on each of these fields.

IP Address

This is the local network address of your Classic. It usually takes the form "192.169.0/1.x" or "10.0.0.x" depending on your networking equipment. You must be careful when selecting this address. If it does not match your network subnet then the classic will not be able to communicate with the network. If it is the same as another device on the network then collisions will occur causing both devices to act erratically. Check your router settings or ask your network administrator which local address to use. Also refer to the troubleshooting section for tips.

Subnet

This refers to the class of local network you are using. This depends on your network hardware but most users should use "255.255.255.0" for this field.

Gateway

This is the address of your router or modem – the device which is connected directly to the Internet proper. It will usually take the form 192.168.0/1.1 or 10.0.0.1 depending on your network configuration and hardware. Check your router settings or ask your network administrator which local address to use. Also refer to the troubleshooting section for tips.

DNS 1 & 2

The DNS is the means by which human-readable internet addresses are resolved to actual IP addresses on the network. These values can usually be set identically to the gateway address depending on your network hardware. If your ISP provides you with specific DNS servers then use those addresses in these fields instead.
Example 1: Your gateway is a DSL modem with address 192.168.1.1. If your ISP has not given you

explicit DNS servers to use then set the **D1** field to 192.168.1.1. **D2** can be ignored.
Example 2: Your gateway is a cable modem with address 10.0.0.1. Your ISP has specified primary and secondary DNS server addresses of 11.22.33.44 and 11.22.33.55, respectively. Set the **D1** address to 11.22.33.44 and the **D2** address to 11.22.33.55.

Web Access

MidNite Solar offers a free web service with which you can access your Classic from a web page from anywhere in the world simply by pointing your favorite web browser to
http://www.mymidnite.com
See the web section further on for instructions on how to create an account and use the web-based system. All communications between the Classic and MidNite Solar's server are encrypted using a strong session-based algorithm. To respect your privacy, however, it is required that you manually enable this feature if you'd like to use it.
In order to enable the web access feature:

- Press **Main Menu**
- Scroll to **NET** menu and press the Enter button
- using the soft keys, navigate to the **ADVANCED** menu **(NET→NEXT→ADVANCED)**
- The **Web Access** option should be highlighted.
- Use the up/down keys to now enable or disable the feature.

Note that the **Web Access** selection indicates the current setting of the feature: i.e. **ENABLED** means the feature is currently in operation.
Note also that you will need the values **MA** and **DI** handy in order to create an account on the MidNite Solar web site. This unique number pair identifies your particular classic to our server and helps to prevent malicious users from trying to access your Classic. The **DI** or Device Id is different than your Unit's Serial Number.

Local Network

Note that your classic identifies itself by name to DHCP-enabled routers as "Classic". There is facility to change the name of a given classic via the local and web-based interfaces as well as using third-party MODBUS software packages.

Advanced

The Classic advertises its address every 10 seconds using the UDP protocol on port (TBD). Advanced users and programmers may use this feature to identify Classics on their network.

Dealer Information Screen

For dealers' convenience the Classic has a display screen that can be modified to publicize the dealers' business information. This is helpful because the customer will know who to contact in case they want to report any problems regarding the product. This will also help to promote retailers' accessories that are compatible with the Classic. This screen is capable of 20 characters per row and four rows, for a total of 80 modifiable characters.
To modify this display screen, follow these steps:

- Press main menu

- Scroll to MNGP and select it
- On the following screen, select LCD and press enter
- On this screen select LOAD DEFAULTS press enter
- On the password select 360 and press enter
- Using the up and down keys will allow you to change the alphabet characters
- Now scroll left and right to go to the next character block
- Do this until your desired message is complete
- Press enter to save on the classic memory

Positive Ground systems

When installing the Classic in a positive ground systems there are a few extra steps that need to be taken. The Ground fault jumper needs to be removed, and ground fault needs to be disabled in the menu. Refer to page 19 for instructions on doing this.

The overcurrent protection needs to be done a little different as well. The input and output breakers need to be double poles. Battery negative and positive conductor both need to be protected. Refer to page 51 for breaker sizing.

IMPORTANT: Do not connect both, positive battery and positive PV input to ground. One or the other positive (normally battery +) but not both otherwise the Classic input and output will be shorted.

HyperVOC ™

HyperVOC is a unique feature the Classic has built in. It refers to DC Input Voltage when it is above the maximum operating voltage (150V, 200V 250V). It will be the maximum operating voltage PLUS the nominal battery voltage. For example, the Classic 250 has an input voltage rating of 250 Volts "operating", if the Classic 250 is connected to a 48V nominal battery bank the HyperVOC upper voltage limit will be, 250V + 48V or, 298 Volts without breaking, what this means is if Classic input voltage rises above 250 volts, it will switch off and go to HyperVOC mode. In this mode the microprocessor will continue running, meaning there is no manual reset needed and all other functions like AUX still work. When the input voltages come back down to the operating rated voltage of the Classic it will wake up and start charging. This could happen in a really cold morning with a voltage open circuit close to the maximum operating input voltage.

Note 1. A HyperVOC message will be displayed on the bottom right side of the Status screen.
Note 2. Max nominal battery voltage to be added is 48v

HyperVOC can be useful in overcoming an industry shortcoming in charging 48 volt battery's with standard panels. For example let's take a sample system with Solar World 165's they have a VOC of 44.1vdc. The industry has limited us to 2 of these panels in series making it hard to charge a 48vdc battery on hot summer days. With the Classic we designed in Hyper VOC to allow you to run 3 of these in series. 3 panels at 44.1vdc will give you a total VOC of 132.3vdc. When temperature compensated for cold climates to 125% gives you 165vdc. This is above all the maximum safe limits for most controllers but falls well into the Hyper VOC range of the Classic. We do have to use Hyper VOC wisely though if we abuse it the Controller will never wake up in colder weather.

Troubleshooting

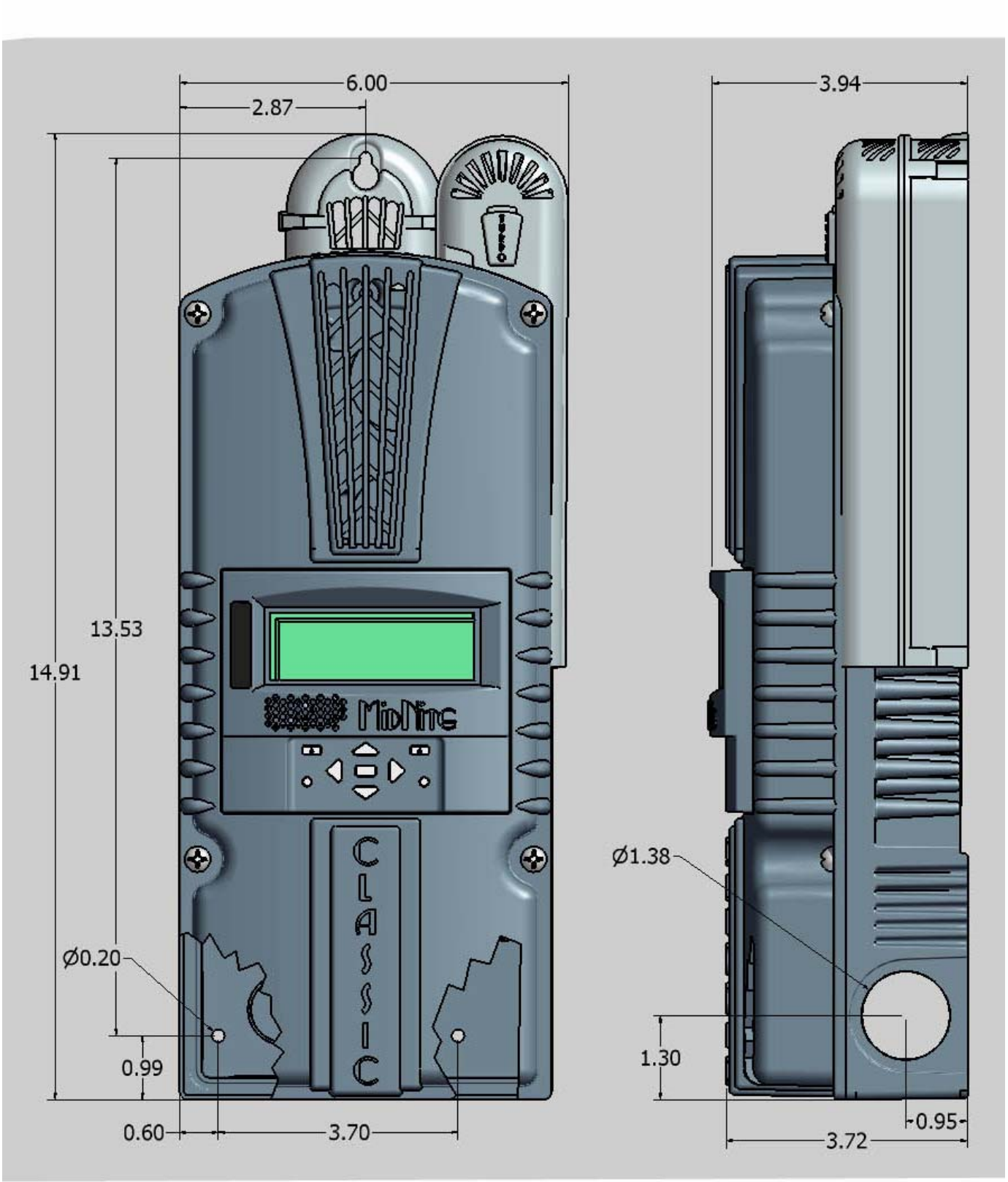
Technical information

Specifications Electrical

Table 6.1

Model	Classic150	Classic200	Classic250	Classic250KS
Operating Volts in	150VDC	200VDC	250VDC	250VDC
Max Hyper VOC	150+battery	200+battery	250+battery	250+battery
Bat charge volts	12-93 volts	12-93 volts	12-93 volts	12-150 volts
Max current out at 25°C	96 amperes	79 amperes	62 amperes	40 amperes
Derate current at 40°C+	80 amperes	66 amperes	52 amperes	33 amperes
Environment	-40c to 40c			
Dimensions of Classic	14.87”X 5.95”X 4.00” 378mm X 151mm X 102mm			
Dimensions of box	19.00”X 8.50”X 5.70” 483mm X 216mm xX145mm			
Shipping weight	11.5 lb 4.9 kg			

Specifications Mechanical



Default Battery charge set points

The table below describes the default preset voltages for the different nominal battery voltages. This means that if you set the Classic from the QUICK SET Menu (see page 25) to a different battery voltage the Classic will take the default voltage set points. Note. If you manually adjust the absorb float or equalize voltage set point, and then nominal battery voltage is changed to a different nominal voltage, (e.g. from 24v to 12v or to 48v etc.) manually adjustments may be required. See page 6 for further information

Table 6.2

Battery Voltage	12v	24v	36v	48v	60v	72v
Bulk MPPT	14.3v	28.6v	42.9v	57.2v	71.5v	85.8v
Float	13.6v	27.2v	40.8v	54.4v	68.0v	81.6v
Equalize	14.3	28.6v	42.9v	57.2v	71.5v	85.8v

To adjust these voltage set point see page 25 of this manual.

Optional accessories

Optional accessories for the Classic include:

Blank display for multiple Classic installations
MidNite network cables various Lengths.

Regulatory Approval

The MidNite Solar Classic charge controller conforms to ***UL 1741, Safety for Inverters, Converters, Controllers and Interconnection System Equipment for Use With Distributed Energy Resources, Second Edition, May 7, 1999 with revisions through January 28, 2010 and CAN/CSA C22.2 No. 107.1: 2001/09/01 Ed: 3 (R2006)***

Warranty

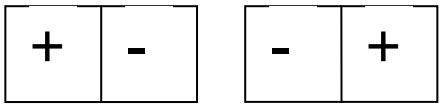
MidNite Solar's Classic comes with a standard 5 year warranty we will repair or replace the Classic at no charge to the consumer during this 5 year period

End of Warranty tune up

MidNite Solar offers a industry first Tune up / Extended Warranty. 6 months prior to the end of the warranty period Customers can ship their Classic back to MidNite Solar with a check for $125 dollars and we will replace any wearable items like the fans and the capacitors and in general tune the Classic up. This will also extend the warranty by 2 additional years as well.

Aux 1 and Aux 2 Graphs/Jumpers

Figure 3.0



Aux 2
IN/OUT

Aux 1
RELAY/OUT

Figure 3.0 shows the two Aux port terminals, with their respective polarities. These terminals are located at the bottom of the power board below the battery temperature jack. Use a mini flat head screw driver to tighten the screws. The jumpers are described in the section below.

In order to select operation of Aux 1 between relay contact or 12v output JP6 and JP8 need to be configured accordingly following the instructions provided in this section.

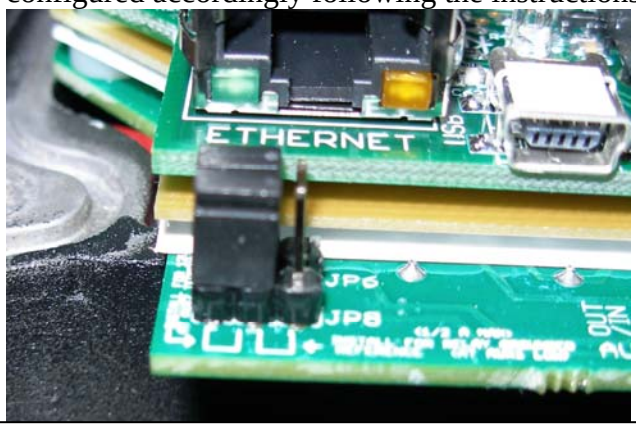


Figure 3.1
JP6 and JP8 positioned to supply 12v out of the Aux 1 terminals

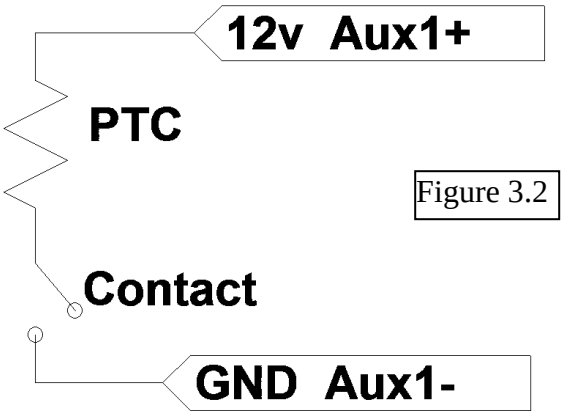
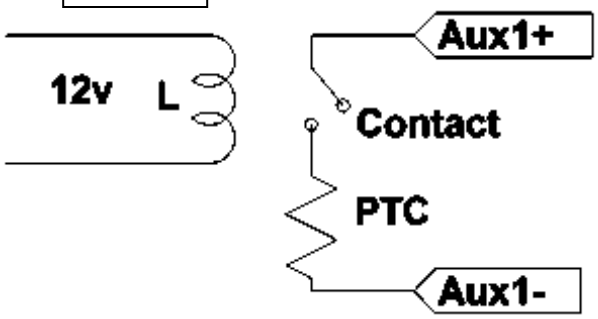


Figure 3.2

When Aux 1 is used to supply 12v out, JP6 and JP8 have to be in the position shown in Figure 3.1. The basic schematic of how this works is shown in Figure 3.2. The 12v out is more like 14.5v. The maximum current from Aux 1 should not exceed 200mA. The Aux 1 output can be set to operate at either Active High (12V) or Active Low (0V) when the Aux 1 function condition is true. For more information see Table 2.1, page 31.

Figure 3.3



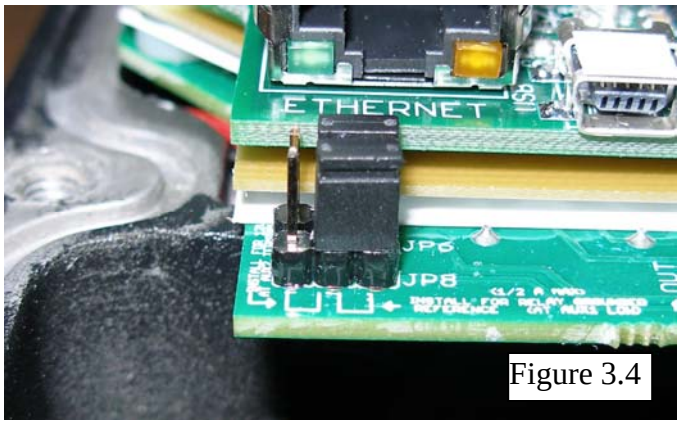


Figure 3.4

To configure Aux 1 to use the internal relay, JP6 and JP8 have to be in the position shown in Figure 3.4. This configuration is commonly known as “dry contact” because it does not provide 12v at the Aux1 terminals; it acts more like an isolated switch (to the ratings of the relay). The Aux 1 output can be set to operate at either normally open, (Active High) or normally closed (Active Low) when the Aux 1 function condition is true. For more information see Table 2.1, page 31. This is ideal for an Auto Gen Start.

Aux 1 Voltage-Time Relation (Relay/12v)

Aux 1 Function Graph shows the relationship between voltage and time of AUX 1. (The axis labeled VOLTAGE could be battery, PV, wind input voltage, etc. depending on the function selected by the user) VHIGH is the upper voltage limit, as soon as the voltage reaches this limit the Delay time will then start, as soon as the Delay time expires AUX1 will change state and stay there until the voltage drops below VLOW set point, then another timer called Hold Time will start and when this expires the out put will go back to the original state.

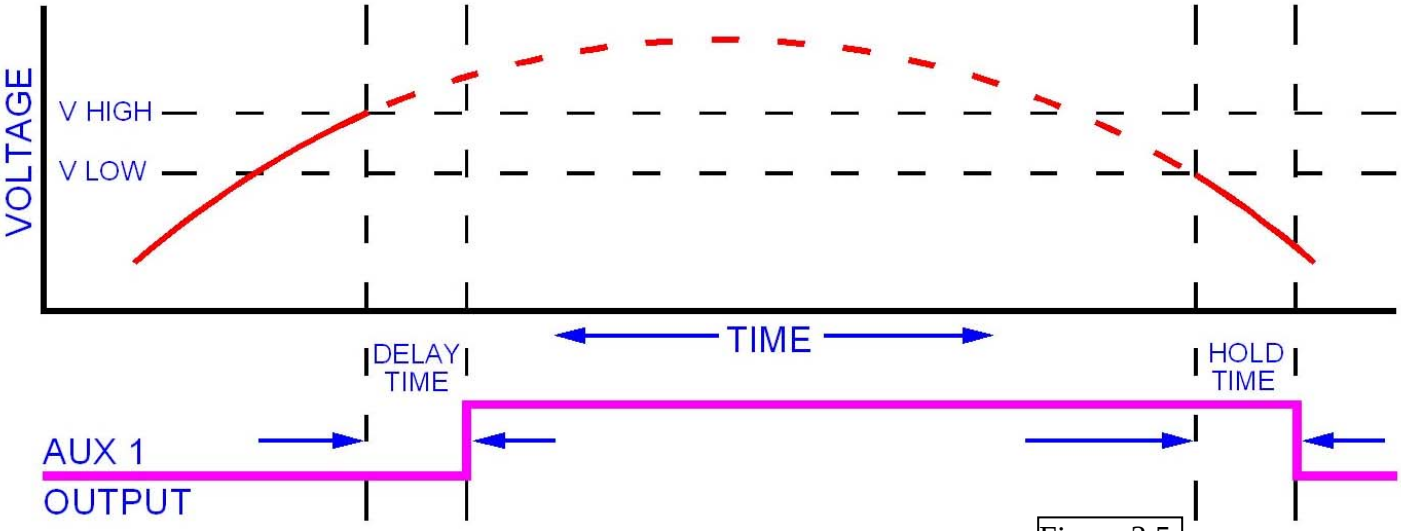


Figure 3.5

Aux 2 Voltage-Time Relation (PWM)

The graph below describes the relation in Aux 2, between voltage and time. The difference in Aux 2 is the use of PWM running at a hundreds of Hz rate and is suitable for use with Solid State Relays (SSRs). The way this works is: user sets a desired threshold and a width voltage, this means that at the desired voltage (VOLTS), the aux will start to PWM and it has to go above or below the width to completely change states (from 0v to 12v, or from 12v to 0v depending on the user selection, active high or active low). This gives a much smoother transition. For more information see; *Configuring Auxiliary Input/Output*. Page 29

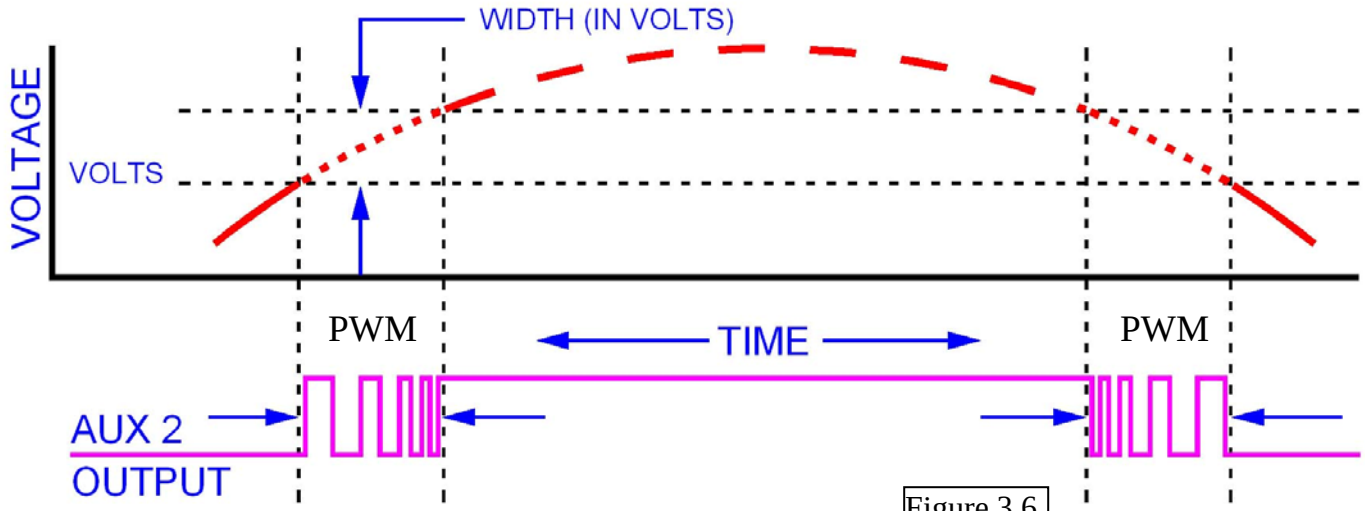


Figure 3.6

Classic Breaker sizing

Model	Bat V	MPPT V (not VOC)	In/Out ratio	Max output A	Output brkr 150VDC	Wire size 310-17*	Max input A	Input breaker/wire with 125% factor**
Classic 150	12	70	5.83	96	100	4AWG	16.46	30A /10AWG - 63A /6AWG 150V
Classic 150	24	70	2.92	94	100	4AWG	32.19	50A/8AWG - 63A/ 6AWG 150V
Classic 150	48	70	1.45	86	90-100	4AWG	59.31	80A/4AWG 150V
Classic 150	12	90	7.5	96	100	4AWG	12.8	30A /10AWG - 63A /6AWG 150V
Classic 150	24	90	3.75	94	100	4AWG	25.06	50A/8AWG - 63A/ 6AWG 150V
Classic 150	48	90	1.87	83	90-100	4AWG	44.38	63A 150V
Classic 150	12	100	8.33	92	100	4AWG	11.04	30A /10AWG - 63A /6AWG 150V
Classic 150	24	100	4.16	91	100	4AWG	21.87	30A /10AWG - 63A /6AWG 150V
Classic 150	48	100	2.08	80	80-90	4AWG	38.46	50A/8AWG - 63A/ 6AWG 150V
Classic 150	12	110	9.16	93	100	4AWG	10.15	30A /10AWG - 63A /6AWG 150V
Classic 150	24	110	4.58	84	90-100	4AWG	18.34	30A /10AWG - 63A /6AWG 150V
Classic 150	48	110	2.29	76	80-90	4AWG	33.18	50A/8AWG - 63A/ 6AWG 150V
Classic 150	12	120	10	92	100	4AWG	9.2	30A /10AWG - 63A /6AWG 150V
Classic 150	24	120	5	82	90-100	4AWG	16.4	30A /10AWG - 63A /6AWG 150V
Classic 150	48	120	2.5	76	80-90	4AWG	30.4	50A/8AWG - 63A/ 6AWG 150V
Classic 200	12	70	5.83	79	80-90	4AWG	13.55	30A/10AWG - 50A/6AWG or 8AWG 300V
Classic 200	24	70	2.91	78	80-90	4AWG	26.8	50A/6AWG or 8AWG 300V
Classic 200	48	70	1.46	76	80-90	4AWG	52.05	80A/4AWG 300V
Classic 200	12	120	10	77	80-90	4AWG	7.7	30A/10AWG - 50A/6AWG or 8AWG 300V
Classic 200	24	120	5	74	80-90	4AWG	14.8	30A/10AWG - 50A/6AWG or 8AWG 300V
Classic 200	48	120	2.5	70	70-80	4AWG	28	50a/6AWG or 8AWG 300V
Classic 200	72	120	1.66	65	70-80	4AWG	39.15	50a/6AWG or 8AWG 300V
Classic 200	12	140	11.66	74	80-90	4AWG	6.34	30A/10AWG - 50A/6AWG or 8AWG 300V
Classic 200	24	140	5.83	72	80-90	4AWG	12.34	30A/10AWG - 50A/6AWG or 8AWG 300V
Classic 200	48	140	2.92	65	70-80	4AWG	22.26	50a/6AWG or 8AWG 300V
Classic 200	72	140	1.94	63	63-70	6AWG	32.47	50A/6AWG or 8AWG 300V
Classic 200	12	160	13.33	73	80-90	4AWG	5.47	30A/10AWG - 50A/6AWG or 8AWG 300V
Classic 200	24	160	6.66	72	80-90	4AWG	10.81	30A/10AWG - 50A/6AWG or 8AWG 300V
Classic 200	48	160	3.33	65	70-80	4AWG	19.52	30A/10AWG - 50A/6AWG or 8AWG 300V
Classic 200	72	160	2.22	53	60-63	6AWG	23.87	50A/6AWG or 8AWG 300V
Classic 250	12	180	15	61	63-70	6AWG	4.06	30A/10AWG - 50A/6AWG or 8AWG 300V
Classic 250	24	180	7.5	62	63-70	6AWG	8.26	30A/10AWG - 50A/6AWG or 8AWG 300V
Classic 250	48	180	3.75	55	60-83	6-4AWG	14.66	30A/10AWG - 50A/6AWG or 8AWG 300V
Classic 250	72	180	2.5	43	50-63	6AWG	17.2	30A/10AWG - 50A/6AWG or 8AWG 300V
Classic 250	12	200	16.6	58	60-70	6AWG	3.49	30A/10AWG - 50A/6AWG or 8AWG 300V
Classic 250	24	200	8.33	60	60-70	6AWG	7.2	30A/10AWG - 50A/6AWG or 8AWG 300V
Classic 250	48	200	4.16	53	60-63	6AWG	12.74	30A/10AWG - 50A/6AWG or 8AWG 300V
Classic 250	72	200	2.77	40	40-63	8-6AWG	14.44	30A/10AWG - 50A/6AWG or 8AWG 300V

*NEC310-17 is the chart for single conductors in free air. This chart is conservatively based on this chart, 75C wire inside a MidNite E-Panel

** MidNite Solar breakers are all rated for 100% duty cycle and do not require 156% safety factor. * above also applies to input breaker and wire.

CLASSIC MENU MAP - Jan 5, 2010